

REVISION OF THE GENUS *CARLIA* (REPTILIA, SCINCIDAE) IN AUSTRALIA WITH COMMENTS ON *CARLIA BICARINATA* OF NEW GUINEA

G. INGRAM AND J. COVACEVICH

Ingram, G. and Covacevich, J. 1989 11 13: Revision of the genus *Carlia* (Reptilia, Scincidae) in Australia with comments on *Carlia bicarinata* of New Guinea. *Mem. Qd Mus.* 27(2): 443-490. Brisbane. ISSN 0079-8835.

Skinks of the genus *Carlia* are confined to Australia, New Guinea and some islands of the Indonesian Archipelago, Marianas and the North Solomons. In Australia, there are 21 species. These are: *C. amax* Storr, 1974; *C. coensis* (Mitchell, 1953); *C. dogare* Covacevich and Ingram, 1975; *C. gracilis* Storr, 1974; *C. jarnoldae* Covacevich and Ingram, 1975; *C. johnstonei* Storr, 1974; *C. longipes* (Macleay, 1877); *C. munda* (de Vis, 1885); *C. mundivensis* (Brooin, 1898); *C. pectoralis* (de Vis, 1884); *C. rhomboidalis* (Peters, 1869); *C. rimula* Ingram and Covacevich, 1980; *C. rostralis* (de Vis, 1885); *C. rubrigularis* sp. nov.; *C. rufilatus* Storr, 1974; *C. schmeltzii* (Peters, 1867); *C. scirtetis* Ingram and Covacevich, 1980; *C. storri* sp. nov.; *C. tetradactyla* (O'Shaughnessy, 1879); *C. trilucantha* (Mitchell, 1953); and *C. vivax* (de Vis, 1884). The taxa, *foliorum*, *burnetti* and *novaeguineae*, formerly assigned to *Carlia*, have been transferred to *Lygisaurus*, a genus recently resurrected from the synonymy of *Carlia* by Ingram and Covacevich (1988). *C. johnstonei grandensis* Storr, 1974, is a variant of *C. amax* and *C. prava* Covacevich and Ingram, 1975, is a northern variant of *C. schmeltzii*. *C. storri* sp. nov. from northern Queensland and southwestern Papua New Guinea is separated from the Papua New Guinean species *C. bicarinata* (Macleay, 1877), which we redescribe. *C. rubrigularis* sp. nov. is found in the rainforests of northeastern Queensland. A new subspecies of *C. pectoralis*, *C. p. inconnexa*, is found on the islands of the Whitsunday Group, mid-eastern Queensland. To stabilize the nomenclature for the species, we declare lectotypes for *Heteropus sexdentatus* Macleay, 1877, *H. cheverti* Macleay, 1877, *H. quinquecarinatus* Macleay, 1877, *H. rhomboidalis* Peters, 1869, *Lygosoma maccooyi* Ramsay and Ogilby, 1890, *H. lateralis* de Vis, 1885, *H. blackmanni* de Vis, 1885, and *H. albertisii* Peters and Doria, 1878, and neotypes for *H. mundus* de Vis, 1885, *Myophila vivax* de Vis, 1884, and *H. bicarinatus* Macleay, 1877.

□ *Scincidae*, *Reptilia*, *Carlia*, *taxonomy*, *Australia*, *New Guinea*.

Glen Ingram and Jeanette Covacevich, Queensland Museum, PO Box 300, South Brisbane, Queensland 4101, Australia; 22 April, 1989.

In reviewing *Carlia* two major problems have been encountered — the presence of only a few distinctive external morphological characteristics on which species diagnoses may be easily based and confusion about some of the names of taxa described by Charles de Vis.

Storr (1974) has noted that examination of large series of *Carlia* specimens is a prerequisite to distinguishing individual and interspecific variation. Live specimens are more easily identified than preserved specimens because colour and pattern, especially of adult breeding males, are useful distinguishing features. These change or are lost with preservation and, as most of the features conventionally used in external morphology based studies (e.g. midbody, supraciliary scale counts) vary greatly and show zones of overlap between *Carlia* taxa, preserved specimens, particularly old specimens, are frequently difficult to identify. When large series of *Carlia* are examined, including live or freshly preserved specimens, most specimens can be easily assigned to species.

Charles de Vis was associated with the Queensland Museum from 1882 to 1911. He was a prodigious worker (Ingram, 1986) and described many new taxa of frogs and reptiles including nine taxa currently referred to *Carlia* (de Vis 1884a,b, 1885, 1888). Type specimens of half of these are believed to be lost (Covacevich, 1971). Despite the fact that de Vis probably deposited at least most of his material in the Queensland Museum, he did not publish either registration numbers for his specimens or the numbers of specimens on which descriptions were based. The problem of assigning de Vis's taxa to currently recognized species is further complicated by the inadequacy of some of his type descriptions. Boulenger (1885) criticized de Vis's papers, noting 'Their author is no doubt stimulated by the desire of promoting herpetological knowledge in his country, but, through his incompetence and want of care, he will do much harm.' This criticism is too harsh. Facilities for research were inadequate in colonial Queensland (Ingram, in press). In this paper, we attempt to

solve the problem of the identity of several of de Vis's names.

TECHNIQUE

Approximately 2000 specimens held in the following museums have been examined: Queensland Museum, Brisbane (QM); Australian Museum, Sydney (AM); Museum of Victoria, Melbourne (MV); Donald Thomson collection in the Museum of Victoria, Melbourne (MV DT-D); South Australian Museum, Adelaide (SAM); Western Australian Museum, Perth (WAM); Northern Territory Museum of Arts and Sciences, Darwin (NTM); Museum of Comparative Zoology, Harvard (MCZ); British Museum of Natural History, London (BMNH); Zoologisches Museum, Humboldt University, East Berlin (ZMB); Museo Civico di Storia Naturale, Genoa (MSNG); Muséum National d'Histoire Naturelle, Paris (MNHN).

The following body measurements and morphological characters have been used in separating the species:

Distance from snout to vent in millimetres (SV); head width at widest part as % SV (HW); tail length as % SV, excluding specimens with regenerated tails (TL); prefrontals (separated or forming a suture); number of supraciliaries on both sides of head (see Ingram and Covacevich, 1988, for definition of supraciliaries); palpebral disc; size of palpebral disc compared with ear aperture size; shape of ear aperture; size, shape and position of ear lobules; number of midbody scales; mid-dorsal scale shape and carinations; number of lamellae under the left fourth toe (where possible); colour and pattern of juveniles, adult males, and females.

The approach adopted in this study is basically a combination of the 'museum' and 'ecological' species criteria discussed by Crowson (1970). Specimens were first sorted intuitively into groups of like specimens. These groups were considered to constitute species if they could be distinguished by at least two characters from other similar groups. Wherever possible, field observations of each 'species' were used to support or change decisions based on morphological differences. Where we had knowledge of the male breeding colours for the groups we sorted, we hypothesized that these would be important in the specific-mate recognition systems (*sensu* Paterson, 1985), which justified our decision to recognize these as specific taxa.

We did not repeat all of the work of Storr (1974). As this revision progressed, it became obvious that there was no reason to repeat his work

for Western Australian and Northern Territory species except for *Carlia johnstonei*. All the localities given by Storr (1974) are included in the distribution maps in this paper.

Carlia Gray

1845 *Carlia* Gray. 'Catalogue of the specimens of lizards in the collection of the British Museum'. p. 271. Type species by monotypy: *Mocoo melanopogon* Gray, 1845.

1885 *Myophila* de Vis. *Proc. R. Soc. Qd* 1: 77. Type species by monotypy: *Myophila vivax* de Vis, 1884.

DIAGNOSIS

Small to moderately large, ground-dwelling or rock-climbing skinks with four fingers and five toes; body scales of adults usually keeled, tuberculate or carinate but occasionally smooth; body scales of juveniles always keeled, carinate or tuberculate; 4 supraoculars; supraciliaries in an uninterrupted series; two presuboculars with 2 scales between the second presubocular and the nasal; lower eyelid moveable with a transparent disk; prefrontals usually separated but may meet and form a suture; frontoparietals fused to form a single shield (which is fused to the interparietal in *C. rhomboidalis*, *C. rubrigularis* and some New Guinean species); no supranasals; parietals contact behind the interparietal; one pair of enlarged nuchals; and supralabials nearly always 7. Most species are sexually dichromatic with male breeding colours of pink, red, orange, blue, yellow or black distributed usually on the sides of the body and/or throat. Further distinguished from *Lygisaurus* de Vis, 1884, by larger number of supradigital scales on fourth toe (10 or more vs fewer than 10) and lower number of premaxillary teeth (usually 13 vs usually 15) (Cogger, 1986).

DISTRIBUTION

Timor, Moluccas, New Guinea, North Solomons, Marianas and northern and eastern Australia. The genus is essentially an Australian one with an apparent centre of abundance in North Queensland (Storr, 1974). Two species groups (*bicarinata*, *fusca*) also occur outside Australia in the New Guinea-Indonesia region. In eastern and northern Queensland *Carlia* species are a conspicuous element of the ground-dwelling reptile fauna. Near Lankelly Creek, via Coen, north eastern Queensland, for example, six species of *Carlia* (*C. coensis*, *C. rimula*, *C. schmeltzii*, *C. vivax*, *C. longipes*, and *C. storri*) have been collected in a small rocky area of open sclerophyll and closed forest along a seasonally moist gully with a dense leaf litter cover.

REMARKS

Greer (1974, 1975) and Storr (1974) have recently re-defined *Carlia*. Storr's definition is based solely on Western Australian specimens. Mitchell (1953), Arnold (1966), Goldman, Hill and Stanbury (1969), Storr (1974), Cogger and Lindner (1974), Covacevich and Ingram (1975), Greer (1976), and Ingram and Covacevich (1980) and Storr *et al.* (1981) have recently reviewed or described *Carlia* species. In addition, Cogger (1975, 1979, 1983, 1986; Wilson and Knowles, 1988) have reported some preliminary results of this study. Ingram and Covacevich (1988) resurrected the genus *Lygisaurus* from the synonymy of *Carlia* for *Lygisaurus foliorum* and its relatives (*sensu* *C. burnetti* and *C. novaeguineae* of Cogger *et al.*, 1983).

We have not used the new names proposed by Wells and Wellington (1984, 1985) for reasons already explained (Ingram and Covacevich 1988a,b). However, all their names that are pertinent to this revision appear to be either junior synonyms or *nomina nuda* and do not affect valid names. These are *Liburnascincus* (= *Carlia*), *Carlia covacevichi* (= *C. munda*), *C. arafurae* (= *C. gracilis*), *C. boltoni* (= *C. gracilis*), *C. instantanea nomen nudum* (= *C. amax*), *C. monsolgaensis nomen nudum* (= *C. triacantha*), *C. mysteria nomen nudum* (= *C. triacantha*), and *C. springelli* (= *C. munda*).

COMPOSITION

Twenty one species of *Carlia* occur in Australia: *C. amax*, *C. coensis*, *C. dogare*, *C. gracilis*, *C. jarnoldae*, *C. johnstonei*, *C. longipes*, *C. munda*, *C. mundivensis*, *C. pectoralis*, *C. rhomboidalis*, *C. rimula*, *C. rostralis*, *C. rubrigularis* sp. nov., *C. rufilatus*, *C. schmeltzii*, *C. scirtetis*, *C. storri* sp. nov., *C. tetradactyla*, *C. triacantha* and *C. vivax*.

***Carlia amax* Storr**
(Figs 1,2,3)

1974 *Carlia amax* Storr. *Rec. West. Aust. Mus.* 3: 160.
Mitchell Plateau, N Western Australia. Holotype
WAM R43350.

1974 *Carlia johnstonei grandensis* Storr. *Ibid.* p. 164.
Groote Eylandt, NT. Holotype AM R13464
(formerly R13464A).

MATERIAL EXAMINED

WESTERN AUSTRALIA: Stewart River, Kimbolton (WAM R51824, 51831); Kimbolton Spring, Kimbolton (WAM R52639); Prince Regent River National Park (WAM R46823-28, 46964, 47450, 46758-62, 46946-8, 46952, 46958); Mitchell Plateau (WAM R43350); Blythe Creek (WAM R47450);

NORTHERN TERRITORY: Port Darwin (QM J2246); Mandorah, Darwin Harbour (AM R52088); Darwin airport (AM R52089); Casuarina Beach, Darwin (QM J24509); Berry Springs Reserve (NTM 2713); Mt Carr, Adelaide River (AM R52090-3; NTM 1237); 32.5km SE

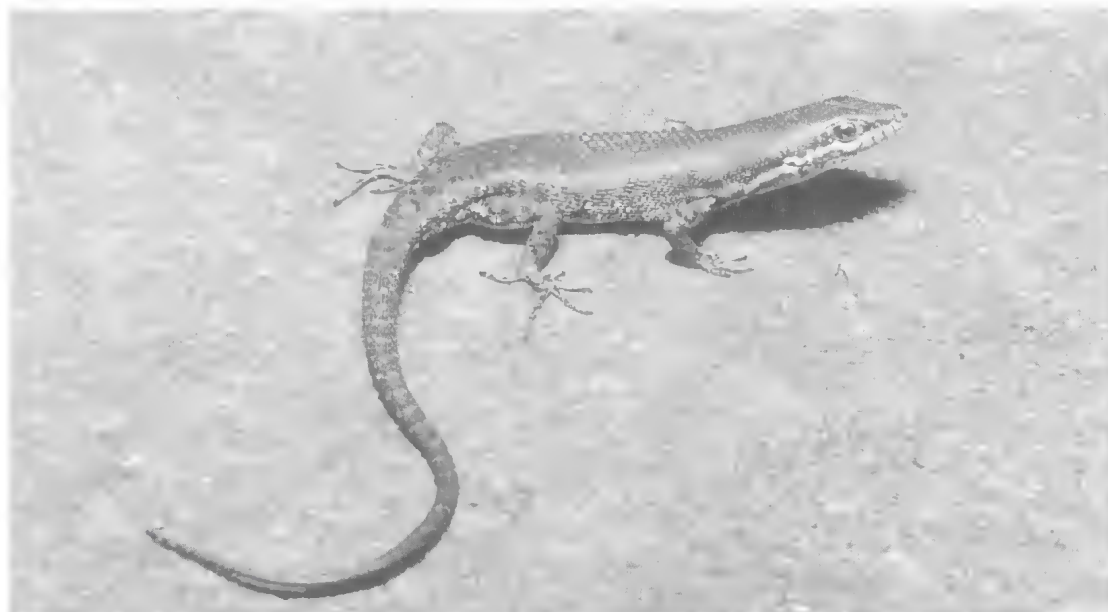


FIG. 1. *Carlia amax*, Katherine Gorge NP, NT (Steve Wilson).

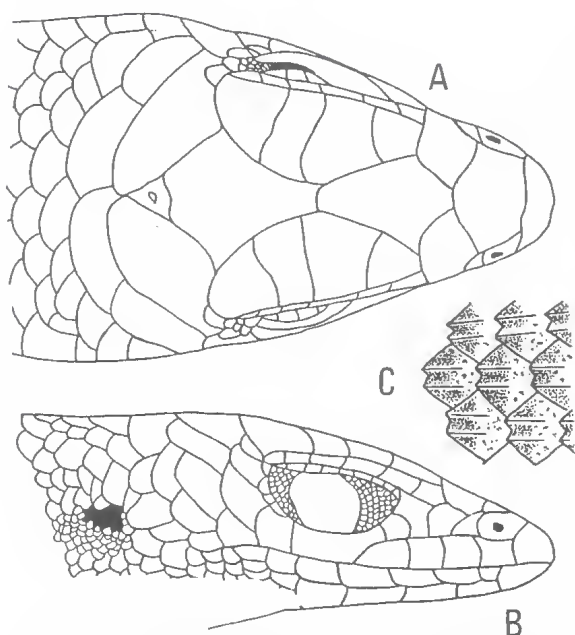


FIG. 2. *Carlia amax* (QM J36729): A, Dorsal view of head. B, Lateral view of head. C. Mid-dorsal body scales.

of Noonamah (NTM 2723, 2728); Robin Falls (NTM 3079); Ban Ban Springs (NTM 3203, 3213-4); Lightning Dreaming Valley, Jim Jim (QM J24515-6); Wollonga Reserve, nr Jim Jim (QM J24517); Pine Creek (QM J23971-2); 75.8km S of Katherine (NTM 1268-9); Katherine (NTM 2172); 6.1km W of Oenpelli (NTM 599); El Sharana (NTM 113-4); Woolwanga Reserve, S Alligator River (AM R41260, 41262); 26.6km SW of Oenpelli (NTM 2655-6); 34.5km SW of Oenpelli (NTM 2645-6); Inyaluk Hill ESE of Oenpelli (NTM 772-4); Radon Creek (QM J36729, 36735-6); Twin Falls, Kakadu NP (QM J36738-40); Mt Brockman (NTM 2412-17, 2499-501, 2961, 3001); 150km N of Dunmarra (NTM 1773); Maningrida Settlement (AM R41927, 41935); 88.5km S of Larrimah (AM R52094); Milingimbi, Crocodile Island (MV D1243); Groote Eylandt (AM R13464, 13607, 54705, 55684); Observation Island, Pellew Group (AM R8121); Cape Arnhem (AM R13585-6, 47171-6; MV DT-D242-5); 5 km N of Borroloola (QM J37188); 3.7km N of McArthur River camp on Borroloola Road (AM R53444); 36.5km N of McArthur River camp on Borroloola Road (AM R53365-7);

QUEENSLAND: Mornington Island (QM J28704); Moonlight Creek, 60 km N of Doomadgee (QM J47790); 42 km W of Mt Isa (QM J42491); Mica Creek, via Mt Isa (QM J43262); Mt Isa (QM R17973); 15 km W of Cloncurry (QM J42079).

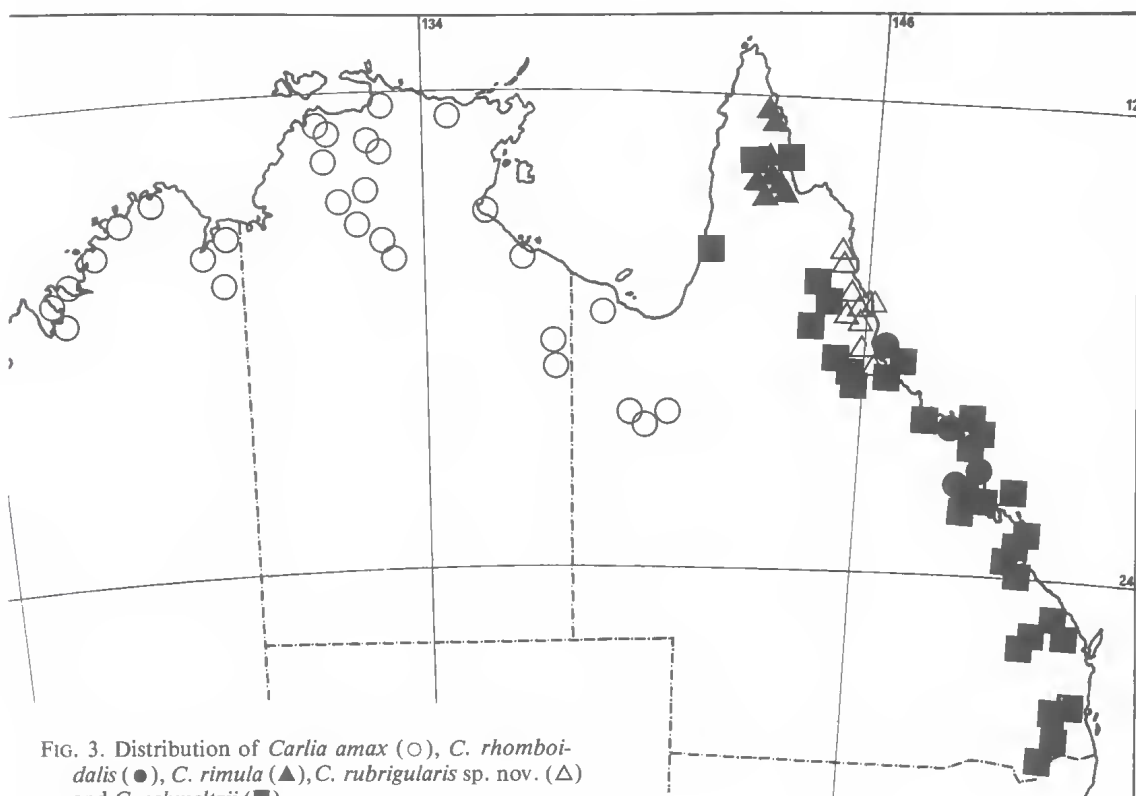


FIG. 3. Distribution of *Carlia amax* (○), *C. rhomboidalis* (●), *C. rimula* (▲), *C. rubrigularis* sp. nov. (△) and *C. schmeltzii* (■).

DIAGNOSIS

A very small (maximum SV 38) *Carlia* with bicarinate and hexagonally shaped mid-dorsal scales and with longer axis of ear aperture horizontal. Distinguished from *C. johnstonei* by smaller ear aperture, fewer, more obtuse lobules and fewer supraciliaries (usually 6 vs 7), and from *C. vivax* and *C. dogare* by more numerous supraciliaries (usually 6 vs 5).

DISTRIBUTION

Far north Western Australia south to latitude 16°30'S; also Heywood, Wood, and Koolan Islands. Far north and north east Northern Territory, south to the watershed between Gulf of Carpentaria and the Barkley Tableland to north-west Queensland; also Groote Eylandt, Maria, Craggy and Observation Islands in the western part of the Gulf of Carpentaria and Mornington Island (see Storr, 1974).

DESCRIPTION

SV: 24-38 (N = 9, mean 34). HW: 14-17 (N = 9, mean 16). TL: 144 (N = 1).

Prefrontals separate. Supraciliaries usually 6 (73%) sometimes 5 (N = 18, mean 5.7). Palpebral disc large. Ear aperture smaller than palpebral disc, longer axis horizontal, usually with a small lobule on anterior margin and occasionally small lobules on other margins. Midbody scale rows 28-32 (N = 9, mean 30.6); mid-dorsal scales strongly bicarinate and hexagonally shaped. Lamellae under fourth toe 25-29 (N = 5, mean 26.2).

Dorsally, laterally, and legs, olive brown, often with dark brown and whitish spotting, and often with dark brown edging to upper and lower labials, and sides of throat; sometimes with chin and throat scales edged in dark brown. Most specimens have a pale top edge to the subocular.

For description of Western Australian and Northern Territory specimens, see Storr (1974: 161).

HABITAT

'*C. amax* is found mainly in rocks especially laterite. It has been collected in spinifex and in leaf litter of deciduous vine thickets growing at the foot of limestone outcrops and sandstone cliffs' (Storr, *in litt.*).

REMARKS

Storr (1974) described *C. amax* and *C. johnstonei grandensis*, basing the latter on two specimens from Groote Eylandt. He distinguished *C. j. grandensis* from the former by its much darker coloration, especially of the throat, chin, and flanks,

and by its greyish white flecking on the sides, but he did not separate them on morphological characters. He also noted that other than in coloration, these two taxa were more like each other than *C. j. grandensis* was like its nominate subspecies. The Mornington Island specimens in the South Australian Museum examined here showed both *C. amax* and *C. j. grandensis* colouring, as well as intermediates between these two extremes. SAM R5330a, R5379c-d, R5398 are olive brown with no marking; R5379a is similar but with some dark brown edging to the sides of the throat; R5330b has the same ground colour but with grey-white and dark brown spotting dorsally and laterally, and dark brown edging to the upper and lower labials and sides of throat; R5384b is similar but with less grey-white spotting, and the throat and chin scales are edged in dark brown. We could not differentiate these specimens on meristic or morphological characters from each other or from mainland *C. amax*. A recently collected series of *C. amax* in the Australian Museum from the McArthur River area, NE Northern Territory showed similar variation. Two specimens (AM R53444 and R53365) have black lined chin and throat scales.

Taking all these factors into account, we regard *C. j. grandensis* a junior subjective synonym of *C. amax*. The paratype of the former (R13464b) has been re-registered as R55684 and the holotype which bore the number R13464a, is now R13464.

Carlia bicarinata (Macleay)

(Figs 4, 5, 6)

1877 *Heteropus bicarinatus* Macleay. *Proc. Linn. Soc. N.S.W.* 2: 68. Syntypes missing, from Hall Sound, New Guinea. Neotype here designated, QM J27717 from Kairuku, Yule Island, Hall Sound, Papua New Guinea.

1878 *Heteropus albertisii* Peters and Doria. *Ann. Mus. Civ. Genova* 13: 362. Yule Island, New Guinea, Lectotype MSNG 28052a (here designated).

MATERIAL EXAMINED

PAPUA NEW GUINEA: Yule Island (QM J27717-9; MCZ 142451, 142454-5; MSNG 28052a-e, 28053); Laloki River, Port Moresby (AM R13853, 14577, 14580, 14606-8, 14628); Port Moresby (AM R10916, 24314-8); Mt Diamond, Central Province (QM J30038-9, 30054, 32846, 32849); Konedobu, Port Moresby (QM J30040-2, 32891); Idlers Bay, 6 km W of Port Moresby, Central Province (QM J30043-5, 32865); Taurama Beach, Central Province (QM J32853-4); Waigani, Port Moresby (J32916, 32922, 32926, 34955-61, 34668-72, 34709-14, 34726-9); Moitaku, Port Moresby (J32930-1, 32934, 32940, 32952, 34623-7, 34663-7, 34673-7, 34704-8); no data (AM R935-8; QM J13974, 13977, 13981, 13990-1, 13993).



FIG. 4. *Carlia bicarinata*, Koki, Port Moresby, PNG (Steve Wilson).

DIAGNOSIS

A small (maximum SV 48) ground-dwelling *Carlia* with strongly bicarinate and hexagonally shaped mid-dorsal scales. Ear aperture with short to long acute lobules around margin. Further distinguished from the Timorese *C. spinauris* (data from Greer, 1976) in having more numerous lamellae under fourth toe (24-31 vs 21-25) and dorsal and lateral scales bicarinate (vs tricarinate). Distinguished from *C. mundivensis* by fewer supraciliaries (usually 6 or 5 vs 7) and fewer midbody scale rows (28-33 vs 34-43). For difference from *C. johnstonei* and *C. storri*, see diagnoses of these species.

DISTRIBUTION

Southeast Papua New Guinea, to the northwest and east of Port Moresby. Apparently restricted to the coastal savannahs. Also Yule Island.

DESCRIPTION

SV: 32-48 (N = 94, mean 40.9). HW: 13-17 (N = 94, mean 15.0). TL: 166-232 (N = 42, mean 202.0).

Prefrontals separate. Supraciliaries 6, commonly 5, and rarely 7 (N = 170, mean 5.7). Palpebral disc small. Ear aperture round, usually smaller but sometimes equal to palpebral disc, with short to long acute lobules around margin. Midbody scale rows 28-33 (N = 90, mean 29.4); mid-dorsal scales strongly bicarinate and hexagonally shaped. Lamellae under fourth toe 24-31 (N = 91, mean 27.4).

Colour and pattern varies between two extremes describe below. Females and juveniles with dark

brown base colour with well defined white mid-lateral and dorsolateral lines, two pale brown paravertebral lines enclosing a dark vertebral stripe, and a dark laterodorsal line between the paravertebral line and the white dorsolateral line. Breeding

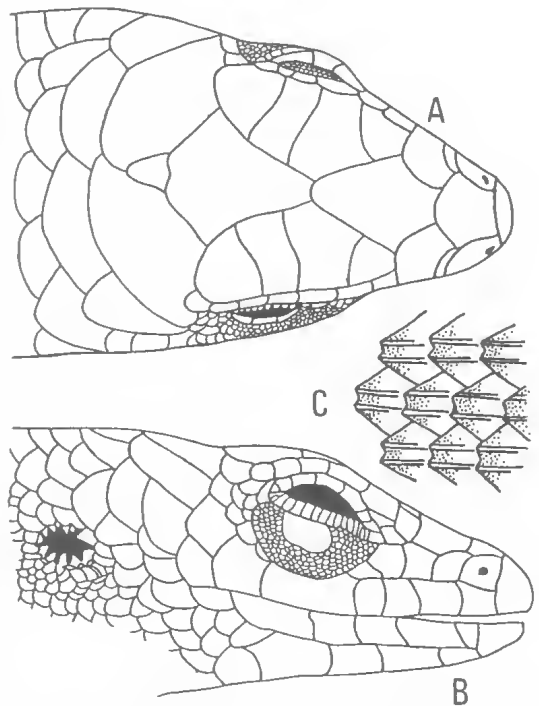


FIG. 5. *Carlia bicarinata* (QM J27717): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

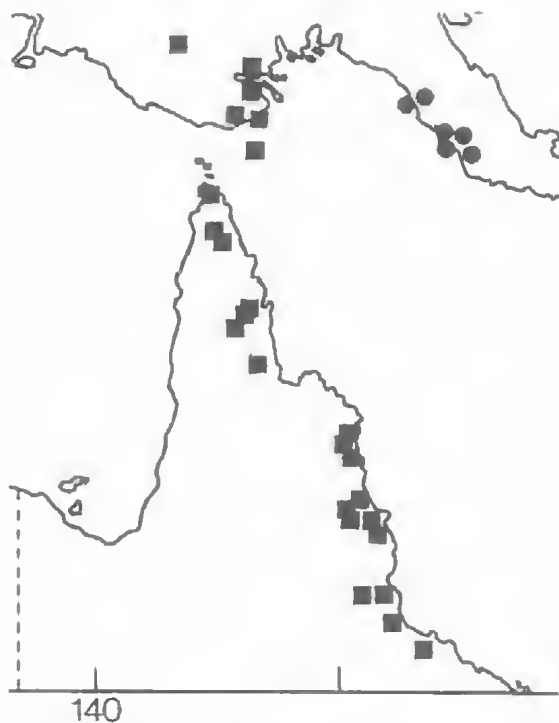


FIG. 6. Distribution of *Carlia bicarinata* (●) and *C. storri* sp. nov. (■).

male heavily spotted with dark brown and with white flecking on body, limbs, and tail; reddish tinge to flanks; labials, side of throat, and under side of head and neck lined in dark brown; a dark line from nares through eye to above ear. Underside white.

HABITAT

Grassy areas in open *Eucalyptus* forest and woodland. Mostly lowlands, but also occurs on the Sogeri Plateau at 550 metres. (F. Parker, pers. comm.).

REMARKS

Goldman *et al.* (1969) could not locate the syntypes of *Heteropus bicarinatus* Macleay. Even so Macleay's short type description can easily be related to an adult male of this species. Ogilby (1890) described and compared specimens from the St Joseph's River District with the types of *bicarinatus*. He was satisfied they were conspecific, and that some specimens were intermediate between the two forms that were described as *bicarinatus* and *albertisii*. Through the courtesy of Dr L. Capocaccia, Museo Civico di Storia Naturale, we were able to examine two syntypes of *Heteropus albertisii* Peters and Doria. These are

an adult male MSNG 28052a (from the syntypic series 28052a-e from Yule Island) and a juvenile from a series of three syntypes from Yule Island (registered under the number 28053). There is another syntype from Mt Epa registered under this number that we did not examine. MSNG 28052a has been selected as the lectotype and thus the type locality for *albertisii* is restricted to Yule Island. To stabilize the nomenclature, we have selected a neotype for *Heteropus bicarinatus* Macleay, 1877, from within the original type locality of 'Hall Sound'.

Neotype: QM J27717 (formerly MCZ 142453) Kairuku, Yule Island, Hall Sound, Papua New Guinea (8°50'S, 146°32'E) collected by F. Parker on 2 November, 1973.

SV: 43. HW: 16. TL: 216.

Prefrontals separate. Supraciliaries 6. Palpebral disc small. Ear aperture round, smaller than palpebral disc, with short to long acute lobules around margin. Midbody scale rows 30. Mid-dorsal scales strongly bicarinate and hexagonally shaped. Lamellae under fourth toe 26.

Heavily spotted with dark brown, and with white flecking on body, limbs, and tail; labials and scales on side of neck lined in dark brown; a dark line from nares through eye to above ear. Underside cream.

C. bicarinata is usually listed as occurring in Australia (e.g. Cogger *et al.*, 1983; Ingram and Covacevich, 1981). However, the specimens belong to distinct taxon, which is similar to *C. bicarinata* (see *C. storri* sp. nov.).

Carlia coensis (Mitchell) (Figs 7, 8, 9)

1953 *Leiopisma coense* Mitchell. *Rec. S. Aust. Mus.* 11: 82. Coen, NE Queensland. Holotype MCZ 37171.

MATERIAL EXAMINED

QUEENSLAND: Leo Creek, 56 km NE of Coen (QM J32513-4); Leo Creek Goldmine, 30 km NE of Coen (AM J37434); Steene's Hut, 30 km NE of Coen (QM J34499); Steene's Grave, 2 km E of Birthday Mountain (QM J37438); Peach Creek, 19 km ENE of Mt Croll (QM J37437); Weather Station, 19 km ENE of Coen (QM J37435, 37440); 12 km NW of Coen (QM J37439); Coen River, 10 km NE of Coen (QM J37428-31); Lankelly Creek, 10 km NE of Coen (QM J37432-5); Rocky River (AM R16327, 16332, 16294); Upper Lankelly Creek, 16 km E of Coen (McIlwraith Range (QM J21392-3); Lankelly Creek, Coen (QM J23405-7); Coen (MCZ 37170-1); 3 km SW of Coen (QM J37436); 13 km S of Coen (QM J26297).

DIAGNOSIS

A very large (maximum SV 68) *Carlia* with



FIG. 7. *Carlia coensis*, 13km S of Coen, NEQ (David Knowles).

smoothly curved posterior edges to the mid-dorsal scales; dorsal and lateral scales with 3-5 weak carinations with each keel broken up into a series of 2-4 smaller points; ear aperture vertically elongate with small rounded lobules on margins; and with markedly dark and light patterned juveniles. For differences from *C. rimula* and *C. scirtetis*, see diagnoses of these species.

DISTRIBUTION

Known only from the McIlwraith Range and Table Range between Coen and the Pascoe River, Cape York Peninsula, Queensland.

DESCRIPTION

SV: 29-68 (N = 26, mean 44.9). HW: 16-20 (N = 25, mean 17.7). TL: 149-169 (N = 10, mean 163.7).

Prefrontals separate, rarely forming a suture along midline. Upper ciliaries are enlarged forming a ciliary hood over the eye. Supraciliaries 7, rarely 6 or 8 (N = 52, mean 7.0). Palpebral disc small. Ear aperture usually equal to palpebral disc, longer axis vertical, with small rounded lobules around margin. Midbody scale rows 36-45 (N = 24, mean 39.8); mid-dorsal scales with smoothly curved posterior edges; dorsal and lateral scales have 3-5 weak carinations with each keel broken up into a series of 2-3 smaller points; head scales usually rugose. Lamellae under fourth toe 28-37 (N = 25, mean 33.2).

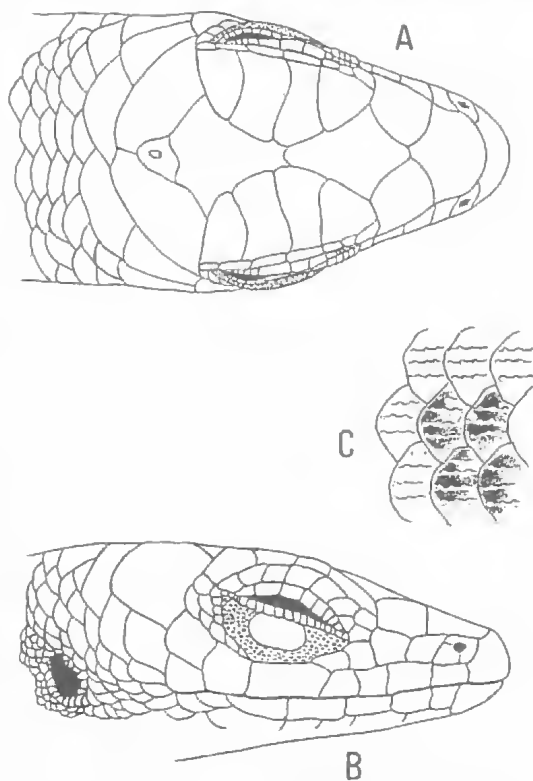


FIG. 8. *Carlia coensis* (QM J23405): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

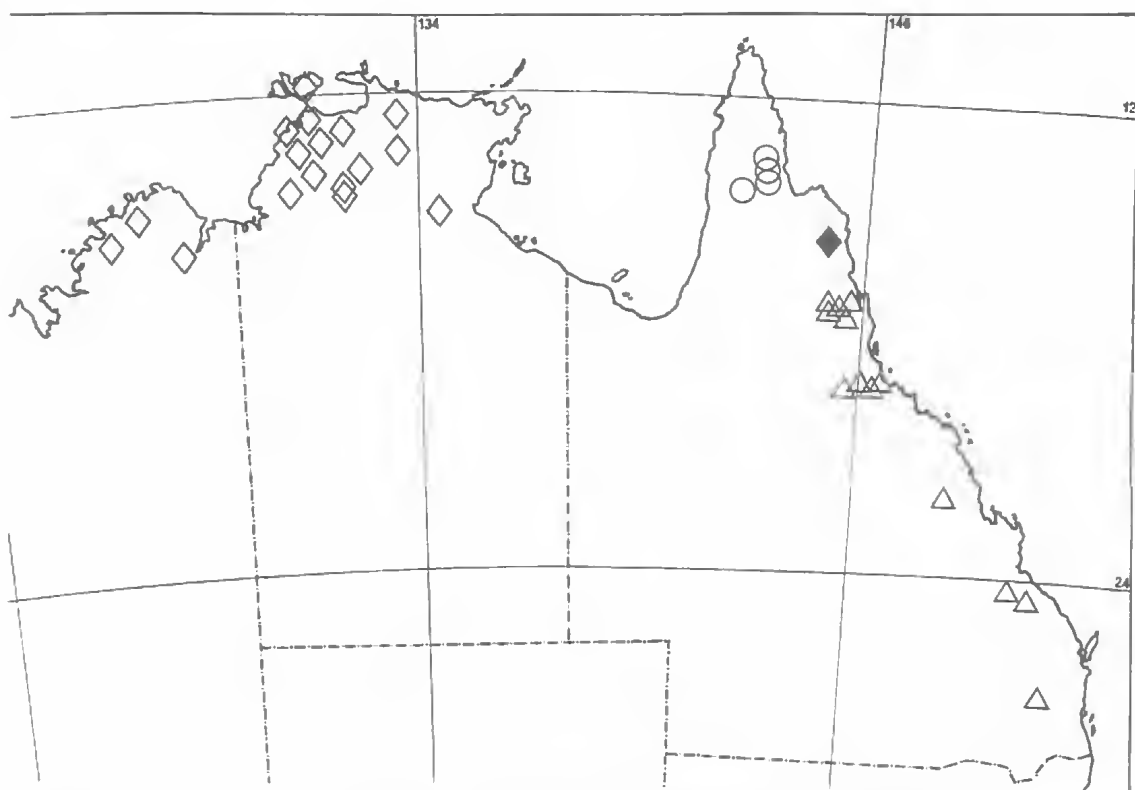


FIG. 9. Distribution of *Carlia coensis* (○), *C. gracilis* (◇), *C. mundivensis* (Δ) and *C. scirtetis* (◆).

Dark brown ground colour, with well defined golden or silver wavy dorsolateral, vertebral, and midlateral lines usually broken up into distinct dashes which continue on to the limbs; dorsolateral lines continuing along tail. Head coppery brown; ear aperture pale edged. In adults this pattern becomes less obvious and some individuals are completely dark brown or black. Underside pale, greyish white to greenish white; feet black.

HABITAT

C. coensis has been collected only from rocks and boulders, or in leaf-litter nearby, in open forest and along creeks in vine-forest.

REMARKS

Carlia coensis is one of six species of lygosomid skinks restricted to bare rocky habitats in Queensland. Three other species of *Carlia* (*C. mundivensis*, *C. rimula* and *C. scirtetis*) also occur only in rocky habitats. All these species have certain morphological and behavioural characteristics in common, which have been summarized and discussed briefly elsewhere (Covacevich and

Ingram, 1978, 1980). Covacevich, Ingram and Czechura (1982) concluded that *C. coensis* was a rare species.

Cogger (1983, fig. 580) has a photograph of a specimen from the Pascoe River, Cape York, which we have not examined.

Carlia dogare Covacevich and Ingram (Figs 10,11,12)

1975 *Carlia dogare* Covacevich and Ingram. *Vic. Nat.* 92: 21. 5-6 km N of the mouth of McIvor River, N Queensland. Holotype QM J20557.

MATERIAL EXAMINED

QUEENSLAND: Bathurst Head (QM J42494); Lizard Island (AM R37196-7, 37211; QM J20436-46, 20451-55, 27309); Eagle Island (AM R6951); Cape Flattery (QM J20749-50); 1.6 km N of the mouth of McIvor River (WAM R45612; QM J20545-8, 20617-9, 20643); 3.2 km N of the mouth of McIvor River (QM J20572); 6.4-8 km N of the mouth of McIvor River (QM J20556-63, 20622-6); N of mouth of McIvor River where Mission road enters beach (QM J32360, 32379, 32387, 32393-5, 32403-4, 32412-20); at beginning of Mission road near Starcke Station (QM J32387).

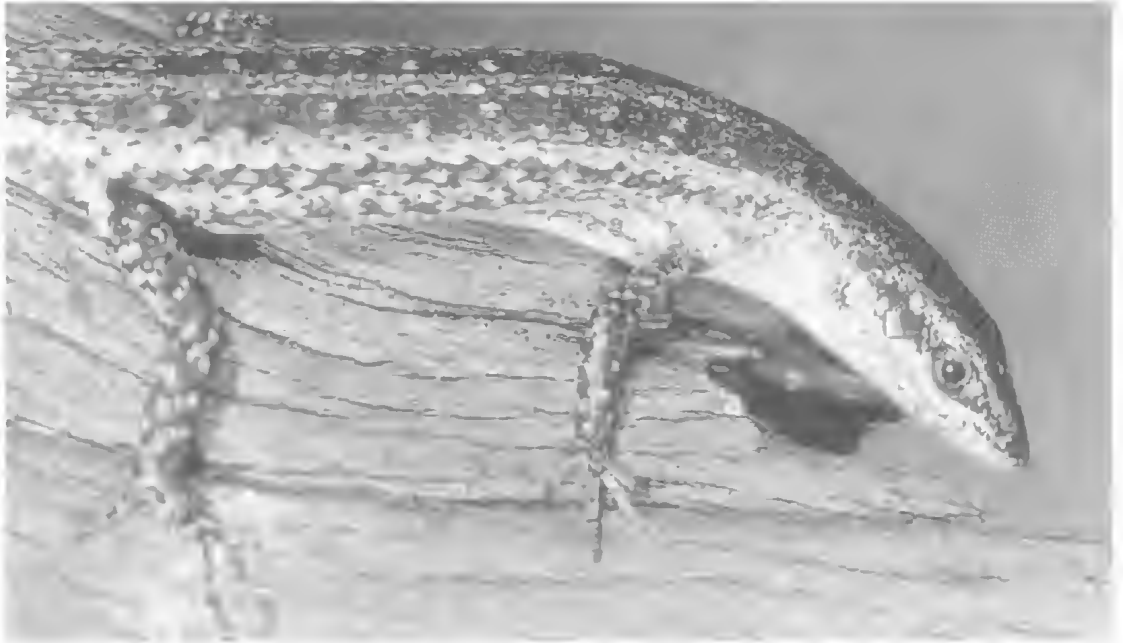


FIG. 10. *Carlia dogare*, Lizard Island, NEQ (Queensland Museum).

DIAGNOSIS

A small (maximum SV 50) *Carlia* with hexagonally shaped and mostly bicarinate mid-dorsal scales; ear aperture vertically elongate usually with larger rounded anterior lobules. Further distinguished from *C. vivax* in having a larger black ear aperture, more ear lobules (usually 2 vs 1) high lamellae count under fourth toe (usually 29 or more vs usually 28 or less) and by juvenile, female, and male breeding colouring and pattern. Distinguished from *C. schmeltzii* by fewer supraciliaries (usually 5 vs 7), from *C. pectoralis* by its lighter colouring, black ear, high lamellae count under fourth toe (usually 29 or more vs less than 29) and female and juvenile colouring. Distinguished from *C. amax* by fewer supraciliaries (usually 6 vs 5) and in having longer axis of ear aperture vertical.

DISTRIBUTION

Sand dune country from the mouth of the Melvor River north to Bathurst Head, and Eagle and Lizard Islands, Cape York Peninsula, Queensland.

DESCRIPTION

SV: 21-50 (N = 48, mean 41.1). HW: 13-18 (N = 45, mean 16). TL: 148-217 (N = 22, mean 173).

Prefrontals separated. Supraciliaries 5, rarely 4 or 6 (N = 47, mean 5.1). Palpebral disc large, occupying much more than half of lower eyelid.

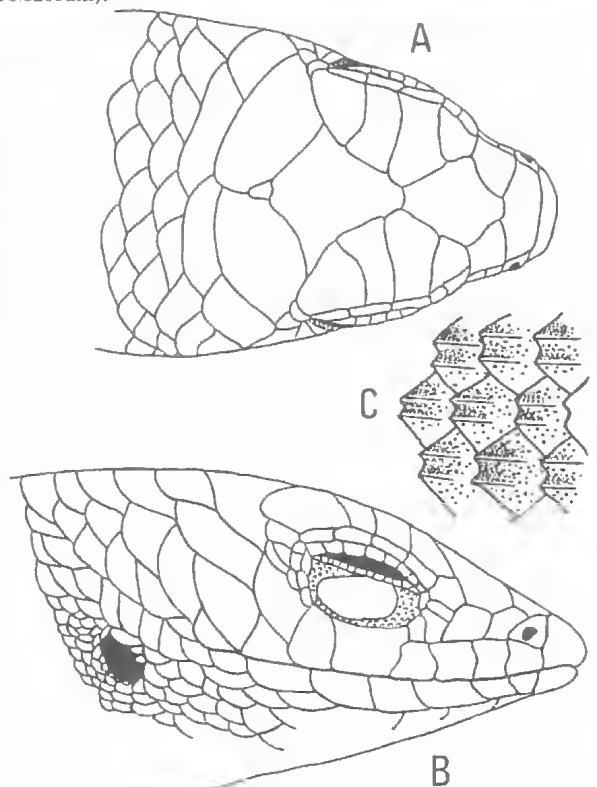


FIG. 11. *Carlia dogare* (QM J20556): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

Ear aperture smaller than disc, longer axis vertical, with 2 lobules (rarely 1 or 3) on anterior margin, upper one larger and more obtuse compared to lower lobule. Midbody scale rows 29-35 ($N = 45$, mean 31.3); mid-dorsal scales angular, usually bicarinate, infrequently tricarinate. Lamellae under fourth toe 26-35 ($N = 45$, mean 31.3).

Ear aperture and margins black. In juveniles and females, head bronze-brown; pale line from nostril along upper labials and under eye; indistinct pale vertebral and dorsolateral lines enclose a series of pale spots with black anterior borders on a brown

background from neck to tail; pale lateral line; legs dorsally brown with white flecking; under surfaces white. In breeding male, uniform brown dorsally and laterally with a grey wash; two orange lateral stripes, the upper beginning above foreleg and finishing above hindleg, the lower from foreleg to just in front of hindleg; and two pink paravertebral stripes. In all phases, there is a white spot at the posterior base of the thigh which sometimes is part of a white line extending along the thigh. Ventrally white.

HABITAT

Heaths and low woodland growing on Quaternary sands.

REMARKS

Little is known of this lizard which has apparently a very restricted range. Covacevich *et al.* (1982) concluded that it was a rare species. Like the sand form of *Ctenotus spaldingi*, it has a bluish appearance in preservative.

Carlia gracilis Storr

(Figs 9, 13, 14)

1974 *Carlia gracilis* Storr. *Rec. West. Aust. Mus.* 3:158. Mitchell Plateau, Western Australia. Holotype R43219.

MATERIAL EXAMINED

WESTERN AUSTRALIA: Mitchell Plateau (WAM); NORTHERN TERRITORY: Reynolds River (AM R52112, 52122-4); near Empire Springs, Reynold River area (AM R52125-7); Rabbit Springs, Reynold River area (AM R52128-9); Darwin (AM R20222, 20225); near East Point, Darwin (AM R52202-6); Mandorah, Darwin Harbour (AM R52107, 52110, NTM 2681-8); Milner, Darwin (NTM 137); Larrykea, Darwin (NTM 2085); Rapid Creek, Darwin (NTM 3122-3); Ludmilla, Darwin (NTM 3409); Casuarina Beach (J23529-30); Berry Springs (NTM 2711-2, 2841, 3003, 3308-11); Howard Springs (NTM 261, 263; QM J24514); Mt Carr, Adelaide River (NTM 1233-4, 1236, 1244-54, 1967); Robin Falls, 16km S of Alligator River (NTM 3077-8); Adelaide River Township (AM R52119-21); 32.5km SE of Noonamah (NTM 2721-2, 2724-7, 2729-30); Hayes Creek, Stuart Highway (NTM 3116); Ban Ban Springs (NTM 3130-2, 3134-5, 3202, 3215); Claravale (NTM 21-4); Wildman River near Junction of West Branch (AM R52113-8); 26.6km SW of Oenpelli (NTM 2657); Oenpelli (NTM 813).

DIAGNOSIS

A very small (maximum SV 41), slender *Carlia* with tricarinate and hexagonally shaped mid-dorsal scales and with longer axis of ear aperture usually horizontal. Further distinguished from *C.*

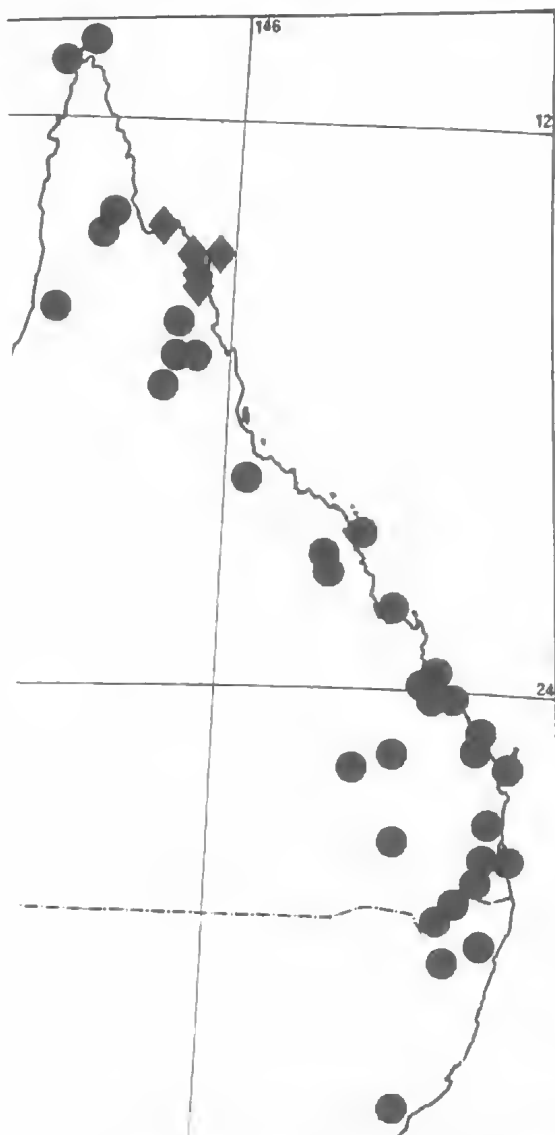


FIG. 12. Distribution of *Carlia dogare* (◆) and *C. vivax* (●).



FIG. 13. *Carlia gracilis*, UDP Falls, NT (Steve Wilson).

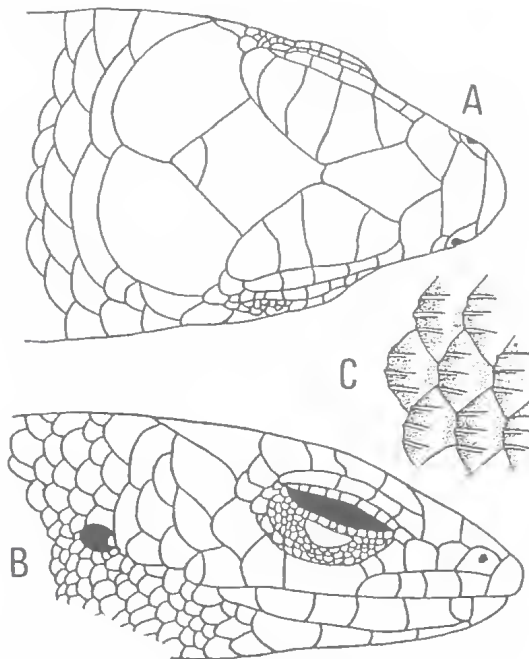


FIG. 14. *Carlia gracilis* (QM J24514): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

pectoralis, *C. munda*, *C. rufilatus*, and *C. jarnoldae* by its smaller palpebral disc (about half of eyelid vs much more than half of eyelid) and from *C. rufilatus* and *C. jarnoldae* in having fewer supraciliaries (usually 5 vs 6 or 7), and from these and *C. munda* in lacking a white stripe from under the eye to the ear.

DISTRIBUTION

Northern Western Australia and Northern Territory. North Kimberley, south to Mitchell Plateau and east nearly to Wyndham; far northern Northern Territory, south to Roper River; also Melville Island (Storr, 1974).

DESCRIPTION

See Storr (1974: 158).

HABITAT

'*C. gracilis* has a strong preference for the leaf litter of closed vegetation, e.g., monsoon forest, coastal thickets and waterside vegetation' (Storr, *in litt*).

Carlia jarnoldae Covacevich and Ingram (Figs 15,16,17)

1975 *Carlia jarnoldae* Covacevich and Ingram. *Vic. Nat.* 92: 19. Wakooka Outstation, Starcke Station, NE Queensland. Holotype QM J20739.

MATERIAL EXAMINED

QUEENSLAND: 18 km NE of Wenlock River crossing on Iron Range road (AM R94090-1); Nichol River Crossing (QM J24668-9); 5 km W of Rokeby Homestead (QM J23443-8); 46 km N of Coen (AM R38499, 38660-3); 3 km N of Coen (QM J26274); 17 km E of Coen (AM R16344-5, 16461-2); Coen (AM R16519-21, 16545-8, 21342); Flinders Island (AM R11077a-c); Melville Range (QM J20513); Wakooka Outstation (QM J20543, 20738-9, 20760-1, 20765); 22.5 km N of Musgrave (AM R38656-9); 11 km NE of Musgrave Station on Marina Downs Road (QM J23621-2); Isabella Falls, 32 km NW of Cooktown (QM J17821); 17 km NW of Cooktown (QM J17821); 14 km W, 3 km N of Cooktown (MV D13714);

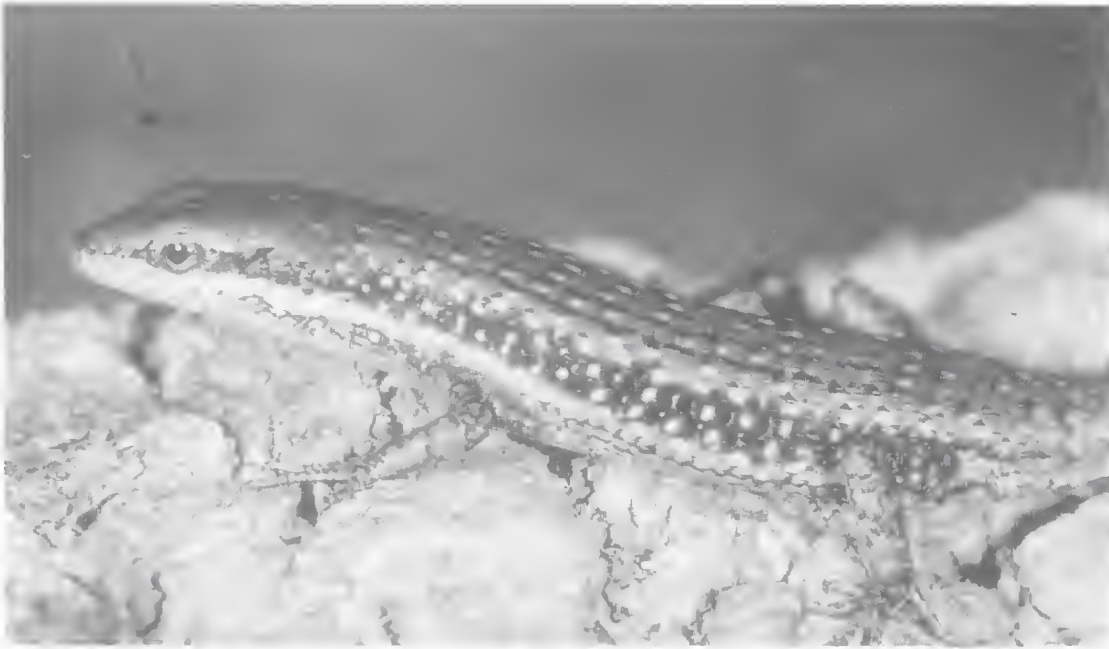


FIG. 15. *Carlia jarnoldae*, locality unknown (Queensland Museum).

Cooktown (QM J24347); Endeavour River (SAM R9737a-c); Laura River, Laura (MV D10259); Palmer River headwaters via Cooktown (QM J25987); Mt Molloy (QM J19407-8, 19411; WAM R45610); Oaky Creek, 11 km W of Cairns (MV D13916); Davies Creek (AM R28463); 8 km N of Tinaroo Dam (QM J12230, 14030-3); Walkamin (QM J26693); Chillagoe area (QM J18036-7); Tinaroo Dam (QM J11843); Stannary Hills (QM J7782-4); 8 km W of Lappa Junction (AM R16449-50); Brownville Battery near Mt Garnet (AM R21319); St Ronans (AM R47141); Mengala Range (NTM 8917); Mt Elliot foothills (QM J25367-8); 36.3 km SE of Townsville (QM J26638-9); 41.8 km SE of Townsville (QM J26663); 50.3 km NE of Charters Towers (QM J23464, 26592-4); 'Brisbane' (QM J1707, 1710).

DIAGNOSIS

A small (maximum SV 49) *Carlia* with hexagonally shaped and moderately tricarinate mid-dorsal scales; ear aperture horizontally elongate. Further distinguished from *C. pectoralis*, *C. munda* and *C. vivax* by colouration and pattern, and by more numerous supraciliaries (usually 7 vs 5). For differences from *C. rufilatus* see the diagnosis of that species.

DISTRIBUTION

NE Queensland from latitude 12°45'S to south of Townsville to latitude 20°S; west to Rokeby Station, near Coen, and the western slopes of the Atherton Tablelands. Also Flinders Island, Princess Charlotte Bay.

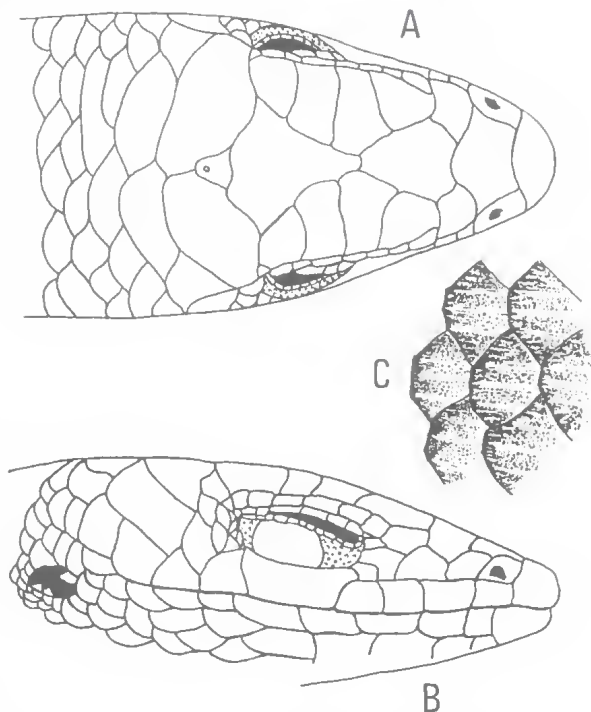


FIG. 16. *Carlia jarnoldae* (QM J26274): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

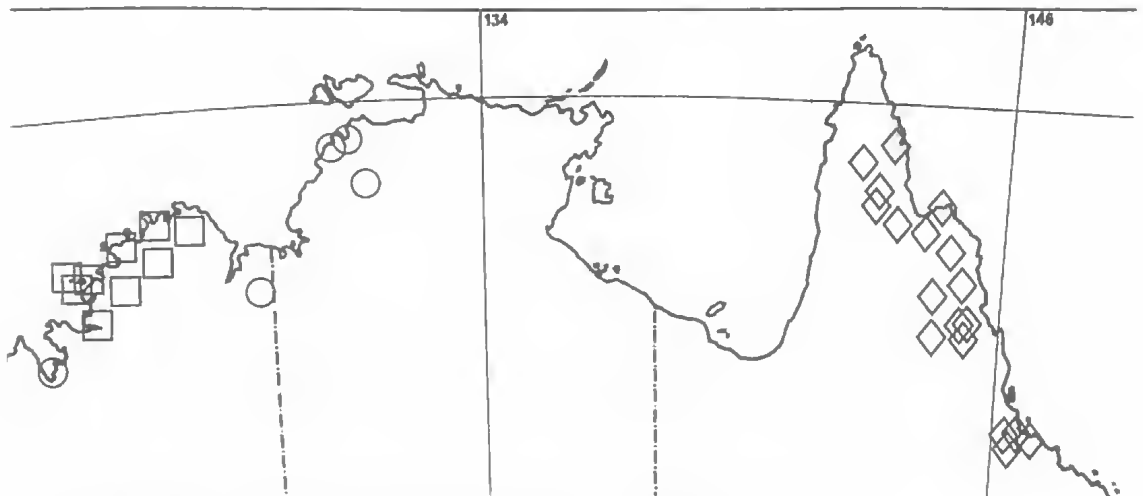


FIG. 17. Distribution of *Carlia jarnoldae* (◇), *C. johnstonei* (□) and *C. rufilatus* (○).

DESCRIPTION

SV: 18-49 (N = 87, mean 38.0). HW: 12-21 (N = 75, mean 17.0). TL: 136-182 (N = 15, mean 157.0).

Prefrontals mostly separate but touching or forming a narrow suture in 9% of specimens. Supraciliaries mostly 7 in the northern part of its range and mostly 6 in the southern part, rarely 8 or 9 (N = 175, mean 6.8). Palpebral disc large. Ear aperture smaller than palpebral disc, longer axis usually horizontal, with a small pointed lobule on anterior margin and smaller ones on other margins. Midbody scale rows 26-33 (N = 82, mean 29.2); mid-dorsal scales hexagonally shaped and moderately tricarinate. Lamellae under fourth toe 22-31 (N = 80, mean 26.1).

Colour and pattern varies between two extremes described below for female and juvenile, and breeding male. In female and juvenile, head

bronze-brown, back and side olive-grey, with a well defined white line edged in black from under eye, through ear aperture, back above foreleg and terminating just in front of hindleg. In breeding male, 5-7 dark blue stripes on a brown background from neck to hindlegs where they break up into spots. The stripes lie between two parallel lines formed by the outer keels of adjacent scales. A thick dark blue stripe flecked with white runs from behind ear to front of hindleg; below this blue stripe there is a red stripe which begins above foreleg and terminates in front of hindleg. A light line starts under eye, passes through, and includes ear, and terminates above foreleg. Undersurface of all specimens white.

HABITAT

Grassy areas in woodland, open forest, and rock ridges. Also rocky dry beds and banks of creeks.

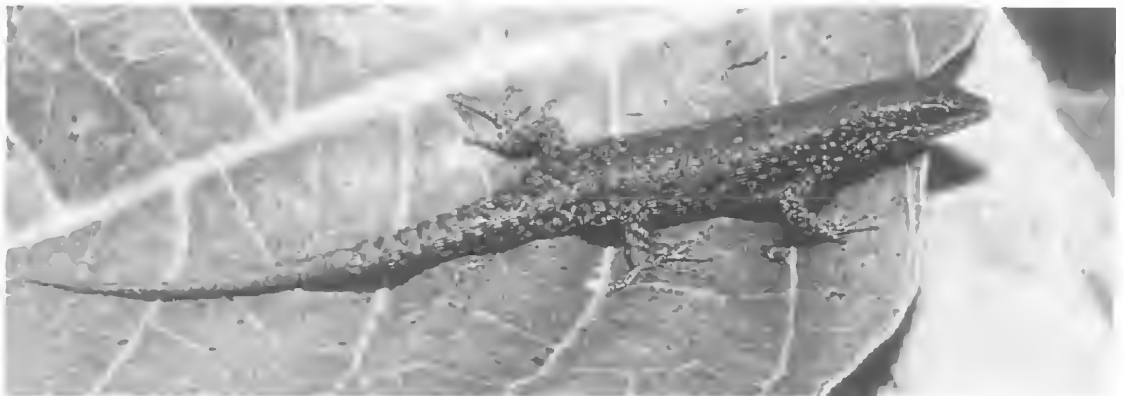


FIG. 18. *Carlia johnstonei*, Manning Ck, WA (Steve Wilson).

***Carlia johnstonei* Storr**
(Figs 17,18,19)

1974 *Carlia johnstonei johnstonei* Storr. *Rec. West. Aust. Mus.* 3: 162. Mitchell Plateau, Western Australia. Holotype WAM R43170.

MATERIAL EXAMINED

WESTERN AUSTRALIA: Mitchell Plateau (QM J23977-8; WAM R43170); Prince Regent River National Park (WAM R46848-9, 46876, 46991, 47003, 47007); Drysdale River National Park (WAM R50523, 50537, 50637, 50758, 50875-6, 50975).

DIAGNOSIS

A very small (maximum SV 43) *Carlia* with bicarinate and hexagonally shaped mid-dorsal scales and with ear aperture margined with pointed lobules. Distinguished from *C. storri*, *C. bicarinata* and the Timorese *C. spinauris* (data from Greer, 1976) by its more numerous supraciliaries (usually 7 vs usually 6), more numerous midbody scale rows (mostly 34-38 vs 27-33, 28-33, 29-33 respectively) and by its fewer lamellae under fourth toe from *C. storri* and *C. bicarinata* (20-26 vs usually 27-34, 28-33 respectively), and from *C. mundivensis* by smaller size (maximum SV 43 vs

56) and lacking the depressed snout of *mundivensis* (Mitchell, 1953, fig. 2). (Mitchell's figure is wrongly labelled (*coensis*) and the captions of figure 1 (which is labelled *vertebralis* = *mundivensis*) and 2 should be reversed).

DISTRIBUTION

Sub-humid north-west coast of the Kimberley Division and adjacent plateaux and continental islands, north Western Australia (Storr, 1974).

DESCRIPTION

See Storr's (1974: 163) description of *C. j. johnstonei*.

HABITAT

'*C. johnstonei* is the *Carlia* of islands and coasts of the wetter parts of northwest Kimberley. It is especially associated with the monsoon forests of basalt country, but is also found in the leaf litter of other kinds of closed or dense vegetation. With *Cryptoblepharus megastictus* it can be found very close to the sea' (Storr, *in litt.*).

REMARKS

Our reasons for placing *C. j. grandensis* in the synonymy of *C. amax* are given under the latter species.

***Carlia longipes* (Macleay)**
(Fig. 20,21,22)

- 1877 *Heteropus longipes* Macleay. *Proc. Linn. Soc. N.S.W.* 2: 66. Endeavour River, NE Queensland. Holotype AM R31878.
1877 *Heteropus variegatus* Macleay. *Ibid.* 2: 66. Darnley Island, N Queensland. Lectotype AM R31869 (Mitchell, 1953).
1877 *Heteropus sexdentatus* Macleay. *Ibid.* 2: 67. Cape Grenville, NE Queensland. Lectotype AM R31879 (here designated).
1877 *Heteropus quinquecarinatus* Macleay. *Ibid.* 2: 67. Darnley Island, N Queensland. Lectotype AM R31873 (here designated).
1877 *Heteropus cheverti* Macleay. *Ibid.* 2: 67. Barrow Island, NE Queensland. Lectotype AM R31877 (here designated).
1885 *Heteropus maculatus* de Vis. *Proc. Roy. Soc. Qd* 1: 169. Cape York, NE Queensland. Type material missing, see Covacevich (1971).
1885 *Heteropus rubricatus* de Vis. *Ibid.* 1: 170. Cape York, NE Queensland. Type material missing, see Covacevich (1971).

MATERIAL EXAMINED

WESTERN AUSTRALIA: 'West Australia' (MV D1384). NORTHERN TERRITORY: Milingimbi, Crocodile Island (MV D208-10); S of Nip Pt, Marchinbar Island, (NTM

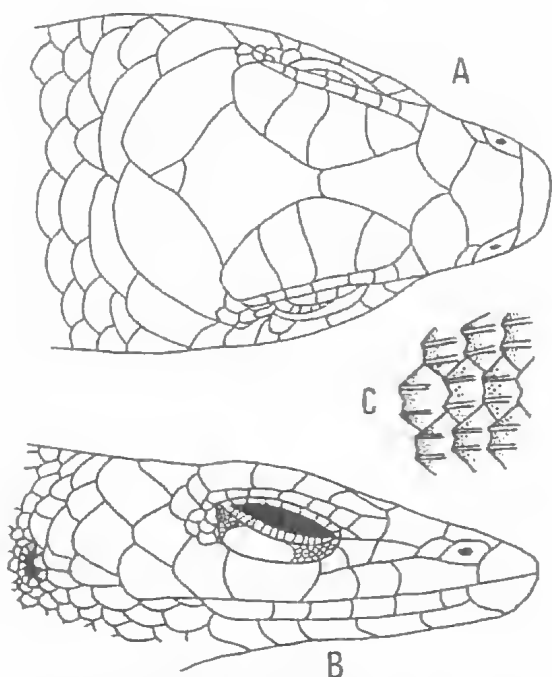


FIG. 19. *Carlia johnstonei* (QM J23977): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

R8950); Derby Creek, Arnhem Land (MV DT-D200, 202, 206-7, 776-8); Groote Eylandt (AM R25782-3; NTM R3357, 7350, 7566); Angurugu Mission, Groote Eylandt (AM R26282); Gove (NTM 1032, 6179); Yirrkala (AM R12093); Cape Arnhem (AM R246); Flat Rock Creek (NTM 5989); Giddy River crossing (R5990-1); no data (NTM R9452).

QUEENSLAND: Darnley Island (AM R31868-81, 42442, 42494; QM J1509); Yam Island (AM R42367); Gabba Island (AM R48476); Boigu Island (AM R48503-4, 48510); Saibai Island (AM R48212, 48214, 48233, 48240, 48314); Dauan Island (AM R48551-2, 48554); Yorke Island (AM R44318-24; QM J6438); Murray Island (AM R42491, 42578, 44215-8, 45902, 45916, 45968-9, 46107, 46121, 46123); Dowar Island (AM R45901, 45935-6, 45939); Mabuig Island (AM R48568-9); Coconut Island (AM R42468-9); Badu Island (AM R48602, 48605); Moa Island (AM R46951-3); Sue Island (AM R42327-32, 42358-61, 42435-40, 42499-503, 42505-11); Hammond Island (AM R42239, 42271, 42285-93, 42297-300); Thursday Island (AM R42376-7; MV D4330-1); Friday Island (AM R38664-6); Horn Island (QM J25650-2, 25666-7, 25685-9, 25798-9, 25807-14; SAM R13675); Prince of Wales Island (AM R46331, 46599-600; QM J6445-6); Lake Boronto (QM J24633-5, 24652, 24797, 25552-5, 25557-8, 25596-8, 25991-2); 1 km W of Naru Point (QM J25601); between Lake Boronto and Lake Witchura (QM J24663); Somerset (QM J24616-8); 9.6 km SW of Somerset (AM R38567-8); 19 km NE of Bamaga (AM R38569-70, 38578-81, 38595); Red Island Point (AM R38577); 1.6 km N of Bamaga (AM R38571-6); Bamaga (QM J25620); Shotgun Creek crossing (QM J26245, 26248-9, 26254-5); Heathlands (QM J26200-1, 26213-20, 26624); Cape Grenville (AM R31879-81); Dulhunty River crossing (QM J24686-7); 9.6 km N of Moreton P.O. (AM R38591-2); Wenlock River at Moreton (AM R38596); 3 km N of Evans Landing, Weipa (QM J25778-84); 24 km NE of Iron Range (AM R38582-9); 24 km E of Iron Range (AM R38597); Iron Range (QM J7795-9); 43 km NE of Pascoe River (AM R38598); West Claudie River on Iron Range Road (QM J24692-4); Claudie River (MV DT-D676, 680); Cape Direction (MV DT-D764-70, 772-4, 777); 1.6 km N of Pascoe River (AM R38600); Pascoe River crossing on Iron Range Road (QM J24673-5); Nichol River crossing, 21 km S of Pascoe River (QM J24667); Archer River (QM J7800-1); Lower Archer River (MV DT-D211-28, 775); 46 km N of Coen (AM R38590); 19 km N of Coen (AM R38594); Vardon Lagoon, Rokeby (QM J23434, 23439); turnoff to Iron Range and Weipa (AM J24645); Spear Lagoon, Rokeby (QM J23463); Clay Hole, Rokeby (QM J23480); Peach Creek (QM J23525); Rocky River (AM R16280-2, 16300, 16304, 16328); McIlwraith Range (QM J21394-5, 21397); 5 km up Lankelly Creek from Coen bridge (QM J26266-8); 4 km N of Coen (QM J23339); Coen (AM R16507, 16511-2, 16543-4, QM J7802); Coen (MV D10271; AM R38593; WAM R45608); 17 km E of Coen (QM J21396); King River (SAM R9881a,b); Bathurst Head (SAM R1942); Melville Range (QM 20508-9, 20511-12, 20596); mouth of the McIvor River (QM J20597, 20605-8); 17 km NW of

Cooktown (QM J17897); 9 km NW of Cooktown (QM J17829); Endeavour River (QM J11154-7; SAM R9743, 9748, 9749a,b, 9750, 9771, 9793; AM R31878); Barrow Island (AM R31876-7); Isabella Falls via Cooktown (QM J24518-9); 14 km W, 3 km N of Cooktown (SAM R9763a,b); Cooktown (QM J24396, 24531); mouth of the Annan River (MV D13915); Mt Hartley (QM J25133); Granites, Home Rule (QM J25163); Wallaby Creek, Home Rule (QM J25180); Home Rule Falls (QM J25292); Home Rule (SAM R9754); Shiptons Flat (QM J11152, 17822-3, 17825, 17827, 17832-4, 17884, 17898-9, 17900, 17905); McLeod River via Mt Carbine (QM J11163-4); 24 km N of Cairns (QM J24193-5); Kuranda Range State Forest, 3 km along Black Mt Road (QM J26692); Cairns (QM J14505); 15 km from Gordonvale on Gillies Highway (QM J25556).

DIAGNOSIS

A very large (maximum SV 65) *Carlia* with smooth or weakly tricarinate mid-dorsal scales with smoothly curved posterior edges; ear aperture vertically elongate, with long pointed lobules on anterior edge and smaller ones on other margins. Distinguished from *C. rhomboidalis* and *C. rubrigularis* by a free interparietal. For differences from *C. rostralis* see the diagnosis of that species.

GEOGRAPHICAL VARIATION

Northern Territory specimens have a weakly developed pattern that is similar to that of Queensland specimens, which are more intensely patterned and coloured. The ground colour is golden brown; the prefrontals are closer together, sometimes touching, and the first loreal is more elongate. In the Torres Strait, populations vary from island to island but show a general trend of intergradation between SW Papua New Guinea and Cape York. This trend is not smoothly clinal. Some insular forms have combinations of small differences in colour, pattern, meristics and external morphology that allow them to be allotted to the island or island group where they were collected. The western island populations are closer to Cape York *longipes* in colouration but differ in having long pointed lobules on the margins of the ear aperture. The populations of the islands close to Papua New Guinea are similar to specimens from there. The central and eastern islands are more similar in colouration and pattern to southwestern Papua New Guinean specimens than they are to those from Cape York Peninsula. Murray and Darnley Island specimens have distinctive juvenile and adult patterns. Southwestern Papuan specimens have similar juvenile patterns to Australian mainland specimens. The pattern of the preserved adults examined is not well defined



FIG. 20. *Carlia longipes*, tip of Cape York Peninsula (Steve Wilson).

and colours have faded with preservation. Some appear to have had red lateral surfaces.

DISTRIBUTION

Southern New Guinea, NE Northern Territory and NE Queensland. In the Northern Territory, NE Arnhem Land, Crocodile Island, Marchinbar Island and Groote Eylandt. In Queensland, Torres Strait Islands and Cape York Peninsula, south to Weipa in the west and Gordonvale area in the east.

DESCRIPTION

SV: 33-65 (N = 301, mean 49.3). HW: 13-17 (N = 231, mean 15.5). TL: 150-205 (N = 107, mean 179.9).

Prefrontals separate, very rarely in contact. Supraciliaries 7, occasionally 6 or 8 (N = 581, mean 7.0). Palpebral disc small, occupying about half of lower eyelid. Ear aperture about same size as disc, usually with one to many long pointed lobules on anterior margin and several smaller pointed lobules round other margins. Midbody scale rows 30-41 (N = 256, mean 33.8); mid-dorsal scales smooth to weakly tricarinate, with smoothly

curved, posterior edges. Lamellae under fourth toe 25-37 (N = 240, mean 31.5).

Colour and pattern varies between the two stages described below. Juvenile: dorsally brown with well defined dorsolateral lines from behind eye continuing for varying distances down back; sides black with a wavy midlateral line from under eye through ear continuing for varying distances along side; white spotting above and below this line, also large blotches and vertical dashes in front of forelimb. Adult males and females: dorsally brown; indistinct white dorsolateral line from behind eye to just past forelimb; black stripe from nostril through eye, above ear and terminating just behind forelimbs; sides red; legs and tail orange brown; labials and lower lateral surface in front of forelimb bluish white. Adults apparently lose the red colouring during the dry season. Ventrally white.

HABITAT

Ground cover in all vegetated habitats except rainforest; also monsoon forest in dry seasons.

REMARKS

Carlia longipes is a member of the *C. fusca* complex. Species of this complex occur in western Indonesia, New Guinea, New Britain, the Marianas and northern Australia. Specimens exhibit great variation in colour and pattern, while varying little morphologically or meristically. We have examined the holotype of *Heteropus fuscus* Duméril and Bibron, 1839, which was the name to which Mitchell (1953) referred *longipes*. The holotype (MNHP 3036 from 'Waigiou and Rawack' Islands, Irian Jaya) is not in good condition. There is little to be said about the specimen other than that it is a member of the *C. fusca* complex. We have avoided revising all the forms of this group in New Guinea because of the lack of ecological and colour data and because there is a need to collect specimens in critical areas (e.g. Irian Jaya) before a final placement of the many available names can be made. The *Carlia fusca* complex is not comprised of distinct forms that are largely allopatric as Loveridge (1948) thought, because in some cases, distinct forms are sympatric but largely restricted to one habitat type

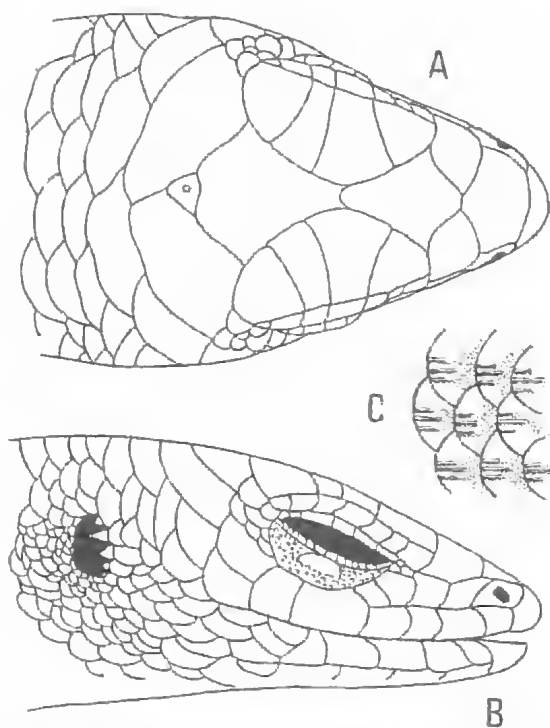


FIG. 21. *Carlia longipes* (QM J24694): A, Dorsal view of head, B, Lateral view of head. C, Mid-dorsal body scales.

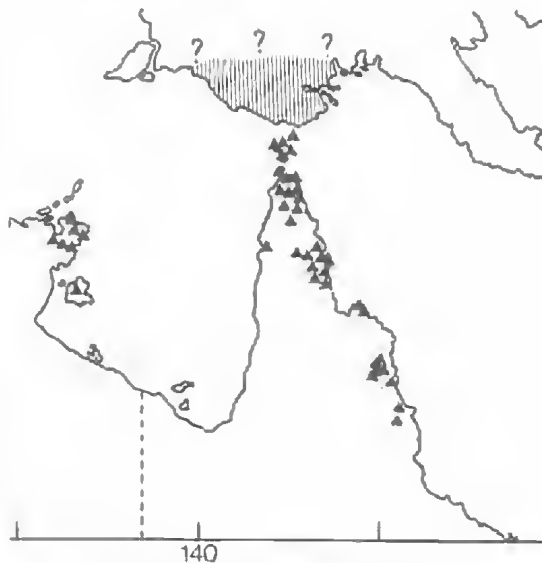


FIG. 22. Distribution of *Carlia longipes* (▲).

(F. Parker, pers. comm.). From a preliminary examination of Papua New Guinea specimens, *C. longipes* appears to be restricted to the southwestern Province. The Australian and the similar form in southwestern Papua New Guinea are distinct from related forms in New Guinea and *longipes* Macleay has been chosen as the available name because of page priority. Mitchell (1953) divided Australian specimens into *Leiopisma fuscum* (Duméril and Bibron) for those from the mainland and *L. f. variegatum* (Macleay) for those from the Torres Strait, and used the presence or absence of dorsolateral markings to separate the two. Queensland specimens, however, have very well defined dorsolateral markings and this division can not be supported. Storr (1974) followed Mitchell in allotting the Northern Territory populations to the nominate subspecies. These have patterns and colours that appear to be 'washed out' versions of those exhibited by Queensland specimens, and adults are reminiscent of adult *longipes* in southwestern Papua New Guinea but are lighter in colouration.

We have examined the syntypes of *Heteropus quinquecarinatus* Macleay (AM R31871-5), *Heteropus sexdentatus* Macleay (AM R31879-81) and *H. cheverti* Macleay (AM R31876-7) and have selected as lectotypes R31873, R31879 and R31877 respectively.

Keast (1962) lists *Leiopisma fuscum* from northern Western Australia, but Kluge (1963) doubted that this species occurred there. There is a specimen in the Museum of Victoria (D1384)

labelled 'West Australia' but it has a typical pattern exhibited by Queensland specimens of *C. longipes* and there is little doubt that the locality is inaccurate.

***Carlia munda* (de Vis)**
(Figs 23,24,25)

1845 *Mocoo melanopogon* Gray. 'Catalogue of the specimens of lizards in the collection of the British Museum'. p. 81. Port Essington, NT. Holotype BMNH 1946.8.16.42. (Name rejected by Boulenger, 1887, as secondary homonym of *Lygosoma melanopogon* Duméril and Bibron).

1885 *Heteropus mundus* de Vis. *Proc. Roy. Soc. Qd* 1: 172. Syntypes missing, from Warro, Port Curtis, Queensland. Neotype here designated, QM J15654, from State Forest, foothills of Mt Larcom, Queensland.

MATERIAL EXAMINED

WESTERN AUSTRALIA: Shathole Canyon, Exmouth (WAM R51023, 52903-5); Bullara (WAM R51024); Marandoo Townsite, Mt Bruce (WAM R52712, 52726, 52736); Prince Regent River National Park (WAM R46903, 46949); Drysdale River National Park (WAM R50686, 50364, 50556).

NORTHERN TERRITORY: Garden Point, Melville Island (NTM 1175); Melville Island (NTM 1176); Snake Bay, Melville Island (NTM 2976); near Empire Springs, Reynolds River area (AM R52098); Darwin (AM R20219); Berry Springs Reserve (NTM 2833); 2 km S of Berry Springs (NTM 1965); Howard Springs (NTM 2092); Mt Carr (AM R52099-100; NTM 1235, 1243, 1246, 1966); Adelaide River Township (AM R52097); 1

km SW of Ban Ban Springs (NTM 3162); Pine Creek (NTM 3098-9, 3115, 3391); 10 km SE of Katherine (NTM 2608-12, 2619-26); Oenpelli (NTM 600-1); 1.6 km S of Tennant Creek (AM R52096).

QUEENSLAND: Near Cape Direction (MV DT-D183); Iron Range turnoff, c. 70 km S of Dulhunty River (QM J24666); 46.6 km N of Coen (AM R38498); Lower Archer River (MV DT-D184-199); Coen airfield (AM R16168, 16173); Coen (AM R16513, 16727-8); Wakooka Outstation, Cape Melville (QM J20483-4); 3 km from Wakooka on W Cape Melville Road (QM J20762-3, 20766, 20768); Strathgordon Station (QM J23930; SAM R9784a,b, 9873); King River (SAM R9848); Edward River Station (SAM R9792, 9944); Hann River, Kennedy road (MV D13177-9); Hann River (SAM R9806a,b, 9894); Kowanyama (AM R1704); 11 km N of Laura (AM R16312-4, 16475); Strathaven Homestead (SAM R9867, 9898a,b); Cook Highway, 32 km W of Mt Carbine (SAM R9766); Mornington Island (SAM R5356, 5380a,c,e, 5384a,c); Karumba (AM R27448); 'Gregory River' (QM J7774); 'Gregory and Norman River' (QM J23913-7); Mt Molloy (AM R3557); Campbell Creek, 3.2 km N of Johnstone River on main road (QM J21391); Lappa Junction (AM R16480, 16487); Black Rock, The Lynd (QM J23910-1); 66.3 km NW of Townsville (QM J26555); 30.7 km S of Townsville (QM J26562); 23.2 km E of Woodstock (QM J26576-7); Reid River, 60 km S of Townsville (QM J26572-7); Reid River, 60 km S of Townsville (QM J26572-5); Box Creek near Mt Dryandra (AM R47871-2); N of Proserpine (QM J25156-7); 3.2 km S of Marlborough (QM J24939); Rockhampton (MV D2213); Hobbie Gully landing, W Curtis Island (QM J24221); Curtis Island (QM J24226-8); State Forest, Mt Larcom (QM J15654); Mt Larcom (QM J24942-3); 25 mls from Gayndah (QM J11846); Upper Burnett River (AM R5497); 12.8 km W of Biggenden (QM J11845);



FIG. 23. *Carlia munda*, Mt Crosby, SEQ (Steve Wilson).

40) 2 km from Gayndah (QM J11846, 11849); Chinchilla (QM J24098); Forest Hill (QM J24835); Ipswich (QM J23912); 2.5 km W of Rosewood (QM J24828-30, 24847); Mt Crosby (QM J 44266).

DIAGNOSIS

A very small (maximum SV 44) *Carlia* with smooth, trisriate, or very weakly tricarinate mid-dorsal scales with smoothly curved posterior edges; large palpebral disc; ear aperture horizontally elongate; and a white line from below eye to top of ear, beginning again from bottom of the ear and continuing for varying distances along lateral surface. Further distinguished from *C. pectoralis* by its smoother scales, horizontally elongate ear aperture, colouration and pattern; and from *C. jarnoldae* and *C. rufilatus* by its smoother scales, fewer supraciliaries (usually 5 vs usually 7), colouration, and pattern.

DISTRIBUTION

Northern half of West Australia south to Cape Range, Hamersley Range and Mundiwindi; also Sir Graham Moore Island, Northern Territory south to latitude 21°S, also Melville and Bathurst Islands (Storr, 1974). Northwest Queensland including Mornington Island, Gulf of Carpen-

taria, Cape York Peninsula north to latitude 13°10', and eastern Queensland south to Ipswich and Chinchilla.

DESCRIPTION

SV: 19-44 (N = 99, mean 35.1). HW: 13-18 (N = 92, mean 16.0). TL: 132-200 (N = 31, mean 165).

Prefrontals usually separated, touching or forming a narrow suture in 17% of specimens. Supraciliaries 5, occasionally 6 (N = 211, mean 5.2). Palpebral disc large occupying much more than half of lower eyelid. Ear aperture much smaller than palpebral disc, horizontally elongate, usually with a few small lobules on upper edge and occasionally smaller ones on other margins. Midbody scale rows 24-32 (N = 96, mean 29.0); mid-dorsal scales smooth, trisriate or weakly tricarinate, usually with smoothly curved posterior edges. Lamellae under fourth toe 21-31 (N = 92, mean 26.2).

Colour and pattern varies between the two extremes described below. Dorsally and laterally olive, spotted with black and white. White line outlined in black, from under eye and inserting at top of ear, recommencing below ear and continuing for varying distances between fore- and hindlimb. In breeding male, midlateral line always reaches hindlimb; body dorsally and laterally speckled with black and white tending to form longitudinal lines; lateral surface suffused with red; side of head and neck dark, throat, neck, and chin scales heavily lined in black. Ventrally white.

For description of Western Australian and Northern Territory specimens, see Storr (1974: 155).

HABITAT

Grassy ground cover. Open forest, woodland, stony ridges, and agricultural lands. Mostly lowlands. Storr (*in litt.*) notes that *C. munda* 'is also a dry site/dry country species. It is probably more varied ecologically than *C. triacantha*. It is found in woodland savannas, on black-soil plains, in spinifex, and in the leaf litter of waterside vegetation.'

REMARKS

Storr (1974), Cogger and Lindner (1974), and Greer (1975) showed that the name *Mocoo melanopogon* Gray applied to this taxon. Cogger and Lindner, and Greer accepted *melanopogon* as the available name, but as Storr (1974) noted, this name is not available under article 59 of the *International Code of Zoological Nomenclature*. It was

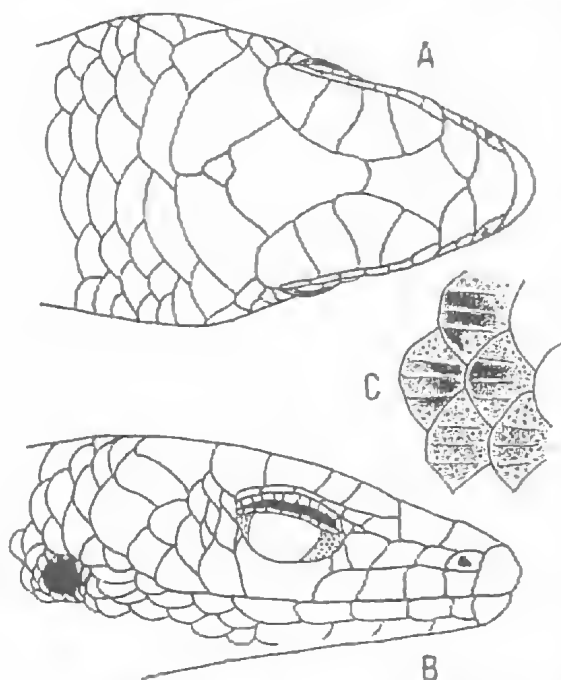


FIG. 24. *Carlia munda* (MV DT-D195): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.



FIG. 25. Distribution of *Carlia munda* (●) and *C. tetradactyla* (▲).

rejected by Boulenger (1887: 288) as a junior secondary homonym of *Lygosoma melanopogon* Duméril and Bibron. Storr used *foliorum* as the available name. Ingram and Covacevich (1988), however, concluded that *Lygisaurus foliorum*, de Vis, 1884, was a senior synonym of *Ablepharus burnetti* Oudemans, 1894, and that *Heteropus mundus* de Vis, 1885, was the valid name.

Mitchell (1953) and Covacevich (1971) could not locate the syntypes of *Heteropus mundus* in the Queensland Museum, but de Vis's description of the ear aperture, dorsal scales and of the 'white line from the preorbital to upper hinder edge of ear orifice, recommencing below it' leaves little doubt that the name *mundus* applies to the same taxon as *Mocia melanogapon*.

To stabilize the nomenclature we have selected a neotype for *Heteropus mundus* de Vis, 1885, from near the original locality of 'Warro'.

Neotype: QM J15654 State Forest, foothills of

Mt Larcom, Queensland (23°49', 151°02') collected by J. Covacevich and T. Tebble on 6 September, 1968.

SV: 33. HW: 17. Tail broken.

Prefrontals touch. Supraciliaries 5. Palpebral disc large occupying much more than half of lower eyelid. Ear aperture much smaller than palpebral disc, horizontally elongate, with small lobules around the margins. Midbody scale rows 30; mid-dorsal scales smooth and tristriated. Lamellae under fourth toe 26.

Olive dorsally and laterally, except for black blotches forming vertebral and paravertebral series. Also there are some white and black dots laterally along with a white line that commences in front and below the eye, continues backwards and inserts on top of the ear, recommences below the ear and continues backwards until it breaks up into dots in the midbody area.

***Carlia mundivensis* (Broom)**
(Figs 9, 26, 27)

1888 *Heteropus vertebralis* de Vis. *Proc. Linn. Soc. N.S.W.* 2: 821. Chinchilla, SE Queensland. Lectotype J248 (Mitchell, 1953). (Name rejected by Zietz, 1920: 211, as a junior secondary homonym of *Lygosoma vertebrale* Hallow).

1898 *Lygosoma mundivense* Broom. *Proc. Linn. Soc. N.S.W.* 22: 643. Muldiva, NE Queensland. Holotype BMNH 1946.8.17.81.

1920 *Lygosoma waitei* Zietz. *Rec. S. Aust. Mus.* 1: 211. (Replacement name for *Heteropus vertebralis* de Vis).

MATERIAL EXAMINED

QUEENSLAND: Cairns district (AM R54631); Mareeba (AM R26087, 26156); 7 km W of Chillagoe (QM J42080-2); Stannary Hills (QM J14015-21); Petford (AM R16473); 4 km E of Watsonville, via Herberton (QM J42128-9); Gorge Creek, Herberton to Petford road (QM J47101); Irvinebank (SAM R2967-8); Koban (SAM R2958); Millstream Falls (AM R47189); Moongobulla (QM J26635); Castle Hill (QM J4408); 'Spyglass' (QM J44686); 'Wando Vale' (QM J44432); 'Fletcher Vale' (QM J44422-3, 44425, 44858); 'Lochwall' (QM J44427-31); 'Toomba' (QM J44424, 44426, 44847-8); 'Glencoe' (QM J44580); 'Lolworth' (QM J 44565, 44570); Mt Cooper (QM J44317, 44716-7); Homevale (QM J33864, 33866, 33871-2, 33874, 33882, 33885, 33887, 33922-38, 33944-5, 33971); Mt Morgan (AM R47190); Marble Mountain (AM J25950); Chinchilla (QM J248, 13719-22).

DIAGNOSIS

A medium sized (maximum SV 56), mottled, dark *Carlia* with strongly tricarinate and/or bicarinate mid-dorsal scales which are hexagonally shaped or with curved posterior edges; midbody

scales rows 34-42, usually 36 or more; ear aperture round, with 9-16 acute lobules around margin.

DISTRIBUTION

Eastern Queensland, from the Chillagoe-Mareeba area, NE Queensland, south to Chinchilla, SE Queensland.

DESCRIPTION

SV: 28-56 (N = 49, mean 46.3). HW: 16-20 (N = 47, mean 18.0). TL: 130-173 (N = 15, mean 155).

Prefrontals usually separate (touching or forming a median suture, in 8% of specimens). Supraciliaries 7, occasionally 6 or 8 (N = 97, mean 7.1). Palpebral disc small. Ear aperture smaller than, or equal to palpebral disc, longer axis vertical, with a series of 9-16 short to long pointed lobules around margin. Midbody scales rows 34-42 (N = 46, mean 38.8). Mid-dorsal scales can be bicarinate and/or tricarinate, hexagonally shaped and/or with rounded posterior edges or a heterogeneous assemblage of these four characters. Lamellae under fourth toe 22-30 (N = 49, mean 24.0).

Head brown with darker mottling, short pale line from eye to temporals; pale subocular line; upper, lower labials and side of face blotched or barred. Dorsal and lateral surface of body, legs and tail heavily blotched with black and brown and with pale speckling; lighter areas tend to form ill-defined vertebral, dorsolateral, and mid-lateral lines which become distinct on tail, and ill-defined transverse barring. Ventrally bluish with some dark speckling under tail and along side of throat.



FIG. 26. *Carlia mundivensis*, Homevale via Nebo, MEQ (David Knowles).

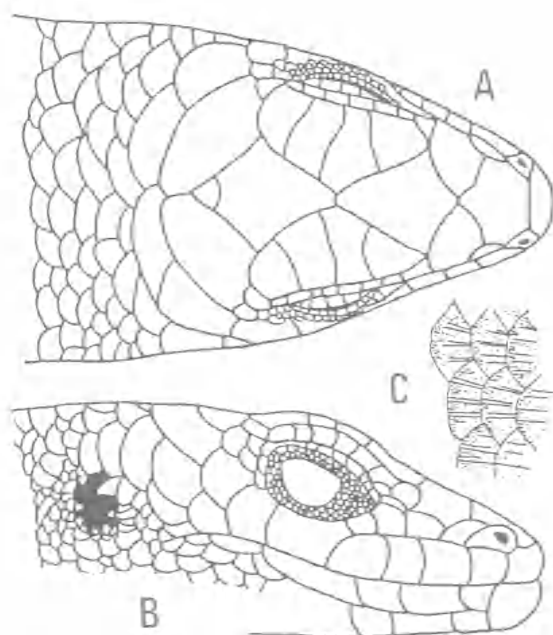


FIG. 27. *Carlina mundivensis* (QM J33922): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

HABITAT

On rocks, tree roots, and in hollow trees in open forest or dry vine forest along creeks in rocky areas. A large population of *C. mundivensis* was discovered during general rainforest surveys in a semi-evergreen vine thicket along a rocky creek on Homevale Station, via Nebo, ME Queensland (Covacevich, 1976). Here, the species was extremely common. Specimens were active, apparently feeding, between 8.30 and 11.00am.

REMARKS

Mitchell (1953) suggested that *Lygosoma mundivense* Broom was a synonym of *Heteropus vertebralis* de Vis. Examination of photographs of the dorsal scales and side of head of the holotype of *L. mundivense*, and consideration of morphological and meristic data provided by Mr A.F. Stimson of the British Museum, confirm Mitchell's opinion. Cogger (pers. comm.), who has examined the holotype of *mundivense* and the lectotype of *vertebralis*, concurs. Mitchell's use of *vertebralis* as the available name, however, was unfortunate. It is not an available name under Article 59 of the *International Code of Zoological Nomenclature* because it was rejected by Zietz (1920), as a junior secondary homonym of *Lygosoma vertebrae* Hallow.

Little is known about this lizard which has been collected in only five broad areas over its 1900km range. It is similar in many ways to two other rock-dwelling *Carlina* species, (*C. scirtetis* and *C. coensis*), but lacks the long legs and the 'broken' keels on the scales of those two species. These three species share the habit of running under and below boulders when disturbed and then coming up the other side to watch the disturbance.

Carlina pectoralis pectoralis (de Vis) (Figs 28,29,30)

- 1884 *Heteropus pectoralis* de Vis. *Brisbane Courier*, November 15, p. 6. [Queensland]. Holotype QM J1414.
1885 *Heteropus lateralis* de Vis. *Proc. Roy. Soc. Qd* 1: 168. Pine River, Moreton Bay District, SE Queensland. Lectotype QM J234, here designated. (Name rejected by Boulenger, 1890: 79 as a secondary homonym of *Lygosoma lateralis* Duméril and Bibron).
1885 *Heteropus pectoralis* de Vis. *Proc. Roy. Soc. Qd* 1: 169. Warro, Port Curtis, Queensland. Holotype QM J1414.
1890 *Lygosoma devisii* Boulenger. *Proc. Roy. Soc. Lond.* p. 79. (Replacement name for *Heteropus lateralis* de Vis).

MATERIAL EXAMINED

QUEENSLAND: Mt Molloy (QM J19417-8); St Ronans (AM R47142); Kirrama Range (AM R37487, 37490-1); Cardwell (QM J26602); Herbert Gorge (QM J2461-3, 2466-7); Magnetic Island (QM J4403, 21021-2, 21024, 24402-5, 24423); The Common, Townsville (AM R27476-8); Townsville (QM J23644; MV D32107); 30.3km SE of Townsville (QM J26641-2, 26645, 26654); Oonoonba (QM J13330); 36.3km SE of Townsville (QM J26643-4, 26646-51, 26653, 26655-60); 18.3km W of Ayr (QM J26604); 30.7km S of Townsville (QM J26587); 41km S of Townsville (QM J25369); Reid River (QM J26571); Arthur Point, Shoalwater Bay (QM J17911); Mt Etna (QM J25746-7, 25759-61); 'Gaylong', Capella (QM J15734, 15785); Port Curtis (QM J1414); north end of Curtis Island (QM J24255-7); Rundle Range (QM J33759, 33795, 33806, 33816, 33830, 33845); State Forest, 60km E of Mt Larcom (QM J15650-3); Gladstone district (AM R24682); 11.2km S of Miriam Vale (QM J11732-4); Warro State Forest (QM J23797-803, 23836-8, 23840-1); Mt Warro (QM J23860-3); 9.6km S of Lowmead (QM J23865-6); Comingleh State Forest via Monto (QM J15691); Bundaberg (QM J22324, 23993); Carnarvon Range (QM J10910); Carnarvon Gorge (QM J22372, 22375-6, 26042); Goodnight Scrub, Burnett River (QM J24950-2); Cordalba State Forest (QM J15746-9); Woodgate Forestry Reserve, 32km E of Childers (QM J15735); Toogoom via Torbanlea (QM J6287, 6321-5, 6327); Robinsons Gorge (QM J24119-24); Eldsvold (QM J2211); Upper Burnett River (AM R5495-6); Biggenden (QM J24072); Gayndah (QM J11842);



FIG. 28. *Carlia pectoralis pectoralis*, Magnetic Island, NEQ (Queensland Museum).

Murphys Lake Taroom (QM J11735); Arcadia Valley via Injune (QM J25903, 25905); 19.2km NW of Gympie (QM J15777); Cooloola (QM J22480, 22482, 22487); Lake Coolomera, Cooloola (QM J24185); Teewah Creek, Cooloola (QM J24188-90, WAM R45005-7); Windera, 8km N of Murgon (QM J24889); 12km E of Burumba Dam (QM J24343); Burumba Dam (QM J24344); Chinchilla (QM J25958); Redbank Creek, W of Esk (QM J24555); Pine River (QM J234); Moonie (QM J24186-7, 241 1-2); Texas Caves area (QM J24940).

DIAGNOSIS

A medium sized (maximum SV 52) *Carlia* with mid-dorsal scales hexagonally shaped and mostly tricarinate; ear aperture vertically elongate with one or two enlarged anterior lobules. Further distinguished from *C. rufilatus*, *C. triacantha*, and *C. schmeltzii* by fewer supraciliaries (usually 5 vs 6 or 7) colour, and pattern. For differences from *C. gracilis*, *C. vivax*, *C. dogare* and *C. jarnoldae* see diagnoses of these species. Further distinguished from *C. p. inconnexa* in having predominantly tricarinate dorsal scales (vs predominantly bicarinate) and in lacking the series of black, longitudinal, dorsal stripes in breeding males.

DISTRIBUTION

Eastern Queensland from Mt Molloy south to the border and west to Capella, Carnarvon Range, Moonie, and Texas. Also Magnetic and Curtis Islands.

DESCRIPTION

SV: 20-51 (N = 141, mean 39.2). HW: 13-19 (N = 128, mean 16.0). TL: 115-254 (N = 58, mean 156.0).

Prefrontals separated, rarely forming a suture. Supraciliaries 5, occasionally 6, rarely 4 or 7 (N = 256, mean 5.2). Palpebral disc large. Ear aperture smaller than disc, longer axis vertical, usually with one or two enlarged lobules on anterior margin. Midbody scale rows 23-34 (N = 146, mean 30.4); mid-dorsal scales hexagonally shaped, usually tricarinate. Lamellae under fourth toe 19-31 (N = 145, mean 26.2).

Colour and pattern varies between the two extremes described below. In juveniles and females, brown-grey, often flecked with black and white, with a well defined white mid-lateral stripe from under eye through ear and continuing for

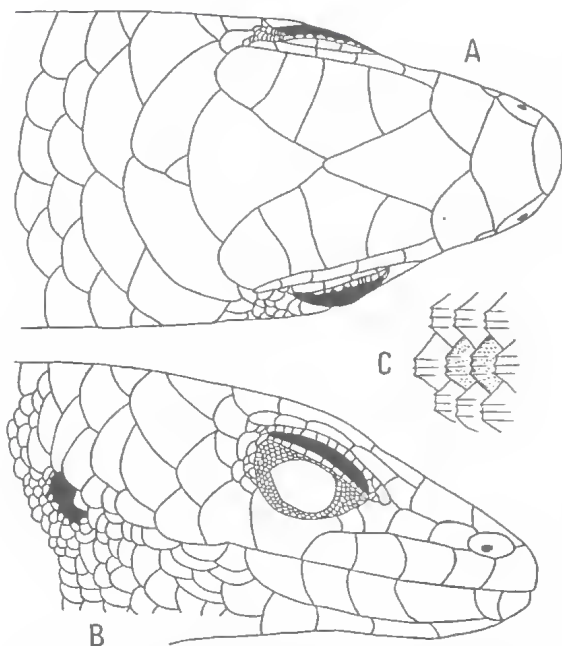


FIG. 29. *Carlia pectoralis pectoralis* (QM J24257): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

varying distances between ear and hind limb, often with a paravertebral series of darker ocellations, and sometimes with labials edged in black. In breeding males, red upper and lower lateral stripes between fore and hind limb, lower one can be broken up into spots; forelimbs and chest red, throat blue; labials, chin, and throat heavily lined in black.

HABITAT

Grassy areas in open forest, woodland, and agricultural lands.

REMARKS

An abstract (de Vis, 1884a) in a local newspaper pre-empted the formal description (de Vis, 1885) of *Heteropus pectoralis*. It said, 'Many of these lizards were gaily coloured, especially one (*H. pectoralis*), which had an orange chest bounded by red on either side, with a pale blue throat, mottled with dark brown'.

The holotype (QM J1414) of *C. p. pectoralis* does not match the measurements given in de Vis's formal type description. These measurements are, however, obviously inaccurate because the type would have a ridiculously long neck of about the same length as the distance between the fore and

hind limbs if these measurements are correct. The length of trunk given as 5.2mm may be a misprint for 3.2mm which is close to that of J1414. This specimen is as described in the remainder of the type description and there seems to be little reason to doubt that it is the single specimen described by de Vis. As well, although faded, the pattern of the specimen matches that described in de Vis (1884a).

The status of *lateralis* has been a matter of contention. It has been recognized as a 'good' species and also treated as a synonym of *peronii*, *vivax*, and *pectoralis* (Boulenger, 1887; Zietz, 1920; Loveridge, 1934; Mittleman, 1952; Mitchell, 1953). All decisions regarding the status of *lateralis*, with the exception of Mitchell's relegation of it to the synonymy of *pectoralis*, have been based only on the original description. Mitchell made his decision following examination of a specimen he regarded as the holotype of *lateralis*, (QM J234) and of the holotype of *pectoralis* (J1414). The former (J234) is a typical *C. p. pectoralis* in all respects. It is not, however, the holotype of *lateralis*. De Vis based his description of *lateralis* on more than one specimen ('... average adult length ...') and did not designate holotypes in any of his descriptions. Additionally, as Greer (1975) has noted, the alleged holotype of *lateralis* (J234) does not agree well meristically or morphologically with de Vis's type description. Despite the fact that J234 is not the holotype of *lateralis*, it is impossible to disregard the distinct possibility that J234 is one of de Vis's syntypes. The specimen was first registered in the Queensland Museum in 1912, some 27 years after *lateralis* was described. The original register entry describes the specimen as a 'type'.

The problem is further complicated by de Vis's work. His type description of *H. lateralis* fits that of a breeding male *C. vivax*. However, his probable syntype of *H. lateralis* (J234) agrees in all respects with *C. p. pectoralis*. The description of *lateralis* is brief but includes two features typical of *vivax* rather than *p. pectoralis* — 'Scales of the back and tail strongly bicarinate . . .' (vs tricarinate); . . . 'On the upper edge of the flanks between the limbs a bright copper-red stripe' . . . (vs always two stripes even if one is broken or indistinct). Subsequent to this description, however, de Vis (1888, p. 822) used 'dorsals tricarinate' as a character of *lateralis* in a key to the *Heteropus* (= *Carlia*) of Queensland. In the same key *pectoralis* is separated from *lateralis* only on a number of midbody scale rows (32 vs 28). Oddly, the type description of *lateralis* gives 30 as the midbody scale count while J234 (the probable syntype

of *lateralis*) has 28 midbody scales, and thus agrees with his second reference to *lateralis* (1888) but not with his type description (1885). This situation is not inconsistent with de Vis's practice of basing type descriptions on several specimens but giving measurements and scale counts of only one syntype. The difficulty of deciding whether a particular specimen is or is not a de Vis 'type' has been discussed elsewhere (Covacevich, 1971).

In an effort to remove the confusion created by de Vis, and because J234 is probably the last remaining syntype of *Heteropus lateralis* despite some discrepancies, we have chosen this specimen as the lectotype of *H. lateralis*. *H. lateralis* thus becomes a junior subjective synonym of *C. pectoralis* (de Vis), confirming Mitchell's (1953) decision.

***Carlia pectoralis inconnexa* subsp. nov.**
(Fig. 30)

HOLOTYPE: AM R47178, Hayman Island, ME Queensland (20°03'S, 148°53'E), collected by F.A. McNeill.

PARATYPES: Hayman Island (AM R10823, 10826, 11015, 11522, 11719, 47165, 47177; QM J25060); Whitsunday Island (QM J42496); Lindeman Island (AM R9756, 10824);

DIAGNOSIS

See *C. p. pectoralis*.

DISTRIBUTION

Only known from Hayman, Whitsunday, and Lindeman Islands in the Whitsunday Group, MEQ.

DESCRIPTION

SV: 40-51 (N = 10, mean 46.2). HW: 15-18 (N = 10, mean 16.6). TL: 187-254 (N = 3, mean 217).

Prefrontals separated. Supraciliaries 5, occasionally 6, rarely 7 (N = 20, mean 5.2). Palpebral disc large. Ear aperture smaller than disc, longer axis vertical, usually with one or two enlarged lobules on anterior margin. Midbody scale rows 30-36 (N = 10, mean 33.1); mid-dorsal scales hexagonally shaped, usually bicarinate but commonly tricarinate; the bicarinate state appears to be derived from the tricarinate condition because the two keels are widely spaced as if the middle keel has been lost. Lamellae under fourth toe 26-32 (N = 9, mean 28.7).

Colour and pattern varies between the two extremes described below. Female with strongly black-blotched paravertebral and upper and lower lateral stripes on brown-grey background; the stripes are flecked with white; faint pale dorsolateral and midlateral lines; top of head brown with a few black blotches. Breeding male, top and sides of head and throat black; body and tail brown to bluish brown with up to ten black, dorsal stripes. Live breeding colours are unknown.

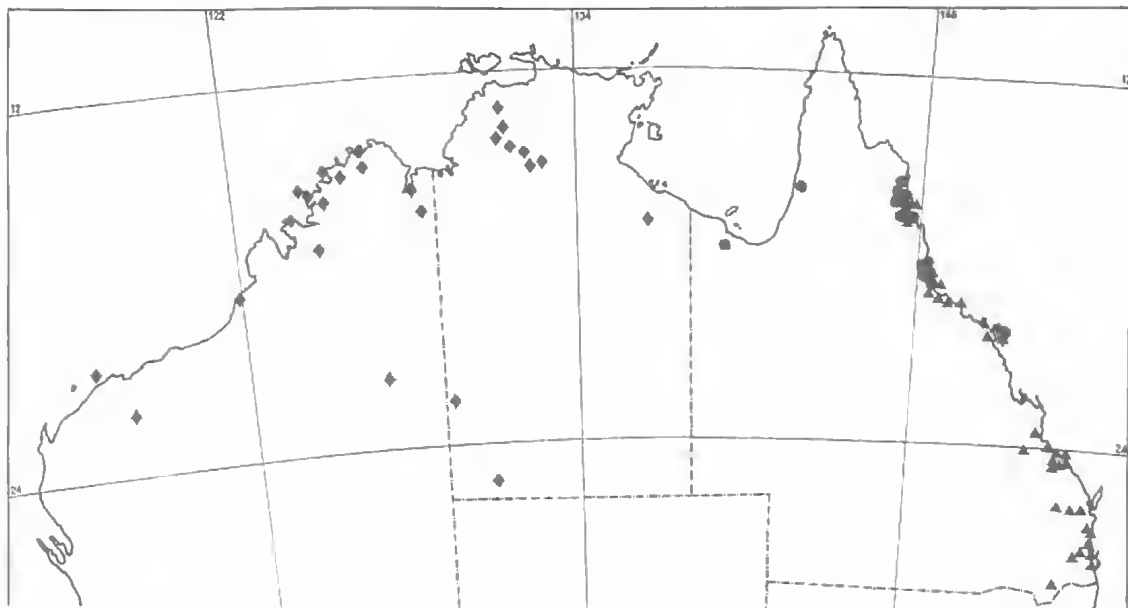


FIG. 30. Distribution of *Carlia pectoralis pectoralis* (▲), *C. p. inconnexa* subsp. nov. (*), *C. rostralis* (●), and *C. triacantha* (◆).

REMARKS

C. p. inconnexa appears to be a robust, melanistic, insular form of mainland *C. p. pectoralis*. However, field work needs to be done on the specific-mate recognition systems of the two forms to discover whether or not the gross differences in pattern do reflect specific status.

C. p. inconnexa and *C. vivax* illustrate some of the difficulties encountered in identifying similar taxa in the genus *Carlia* using only external features. In preservative, where colour and pattern are not very useful, if a specimen of the former has bicarinations or a specimen of the latter has tricarinations, it can be very difficult, if not impossible, to separate the two species. However, besides colour and pattern differences, *C. p. inconnexa* is a much more robust skink.

HABITAT

Unknown.

ETYMOLOGY

The name is from the latin that means 'unjoined', which is an allusion to the skinks insular environment.

***Carlia rhomboidalis* (Peters)
(Figs. 3,31,32)**

1869 *Heteropus rhomboidalis* Peters. *Mber. K. preuss. Akad. Wiss.* p.446. Port Mackay, Queensland. Lectotype ZMB 6509a (here designated).

MATERIAL EXAMINED

QUEENSLAND: Magnetic Island (QM J24421-2, 24434, 25896); Brandy Creek near Proserpine (QM J32745-52, 32762-63, 32778, 32792); Port Mackay (BMNH 1946.8.16.57; ZMB 6509a-e); Finch Hatton (QM J33992-09, 34030, 34032, 34041, 34043-5, 34048, 34059-60, 34063-4, 34068, 34070-3, 34080, 34085); Homevale (QM J33861, 33867, 33869, 33873, 33877, 33880, 33889, 33903-10, 33912-21, 33970).

DIAGNOSIS

A medium sized (maximum SV 57) *Carlia* with smooth mid-dorsal scales with smoothly curved posterior edges. Distinguished from all other *Carlia* species in having the interparietal fused with the frontoparietal scale. Distinguished from *C. rubrigularis* by throat and neck colour (blue and pink vs pink).

DISTRIBUTION

Northeastern to mid-eastern Queensland, from Magnetic Island in the north, south to the Clarke Range, near Mackay.

DESCRIPTION

SV: 21-57 (N = 58, mean 41.3). HW: 14-18 (N = 52, mean 16.2). TL: 125-174 (N = 23, mean 151.9).

Prefrontals separate, interparietal fused to frontoparietal, very rarely free. Supraciliaries 7, occasionally 6 or 8 (N = 119, mean 7.0) Palpebral disc small, occupying about half of lower eyelid. Ear aperture round, usually with one or two large

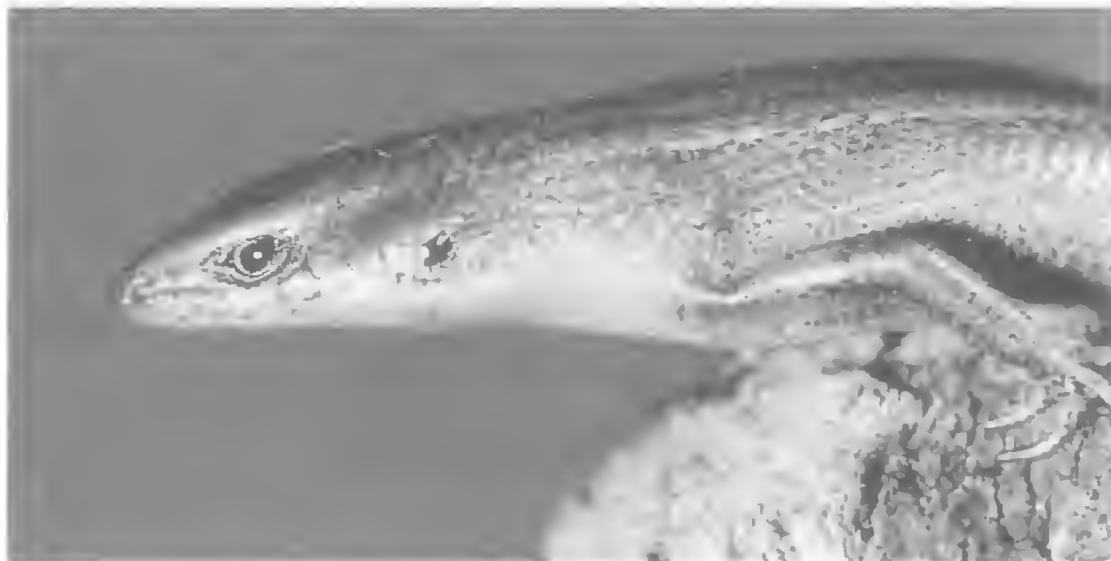


FIG. 31. *Carlia rhomboidalis*, Magnetic Island, NEQ (Queensland Museum).

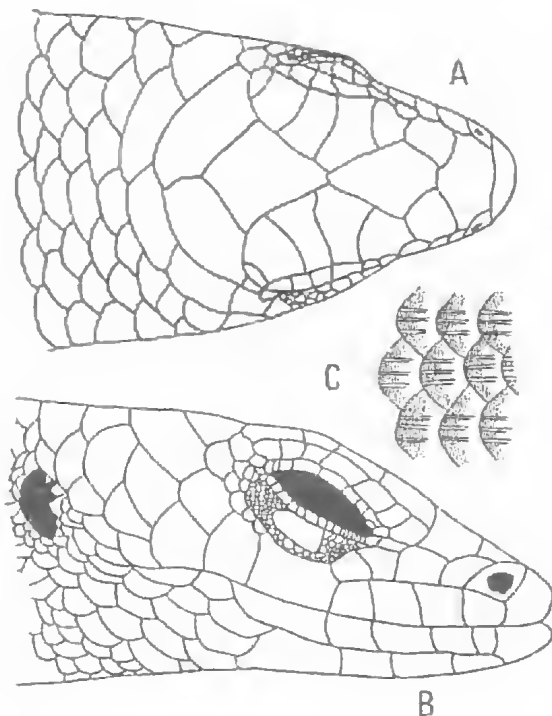


FIG. 32. *Carlia rhomboidalis* (QM J34032): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

pointed lobules on anterior margin and smaller pointed ones around edge. Midbody scale rows 29-36 ($N = 49$, mean 32.1); mid-dorsal scales smooth with smoothly curved posterior edges. Lamellae under fourth toe 25-31 ($N = 48$, mean 27.7).

In juveniles, copper head; gold or white dorso-lateral stripe from behind eye continuing indistinctly along tail; yellowish wavy line which may be broken up into dashes from under eye through eye midlaterally to hind limbs; dorsally brown with dark ocellations forming two paravertebral rows; laterally dark chocolate brown. In adult specimens, the dorsolateral and midlateral lines can be well defined but usually these are broken up or indistinct. In juveniles and adults, the throat, chin, and labials are blue, and neck and sides of neck are pink.

HABITAT

Rainforest and its margins.

REMARKS

The pink throated *C. rubrigularis* and the pink-blue throated *C. rhomboidalis* occupy distinct geographical ranges and may be allopatric subspe-

cies. Field work is required to see if these two forms overlap in the Townsville region and to see if the throat colours are important in the specific-mate recognition system. *Carlia* head-bob when conspecific individuals are sighted.

We have examined the syntypes of *Heteropus rhomboidalis* (BMNH 1946.8.16.57; ZMB 6509a-e) and have selected ZMB 6509a as the lectotype,

Carlia rimula Ingram and Covacevich (Figs 3, 33, 34)

1980 *Carlia rimula* Ingram and Covacevich. In Bailey, A. and Stevens, N.C. 'Contemporary Cape York Peninsula', p. 46. Second Claudie River Crossing, Iron Range Road, NE Queensland. Holotype QM J24602.

MATERIAL EXAMINED

QUEENSLAND: 0.7 km N of Pascoe River mouth (QM J31810); 0.5 km N of Pascoe River mouth (QM J32812); second Claudie River crossing, Coen-Iron Range road (QM J24602-7); Steene's Grave, 2 km E of Birthday Mountain (QM J37484); Buthen Buthen, Nesbitt River (QM J34476-7); Weather Station, 19 km ENE of Coen (QM J37422); Lankelly Creek, 8 km NE of Coen (QM J37423); Coen (AM R16527-8); 16 km E of Coen (AM R47138); 5 km along Lankelly Creek from Coen (QM J26280-3); 13 km S of Coen (QM J26299).

DIAGNOSIS

A very small (maximum SV 39) *Carlia* with smoothly curved posterior edges to the mid-dorsal scales; dorsal and lateral scales having 4 to 5 weak carinations with each keel broken up into a series of 2 to 5 smaller points. Further distinguished from *C. scirtetis* and *C. coensis* by its smaller size (maximum SV 39 vs 64, 68 respectively), low number of midbody scale rows (26-30 vs 40-45, 36-45 respectively); by colour pattern from *C. scirtetis*; and by the presence of an interparietal from juvenile *C. rhomboidalis* and *C. rubrigularis*.

DISTRIBUTION

From the mouth of the Pascoe River in the north and south to 13 km S of Coen, Cape York Peninsula, Queensland.

DESCRIPTION

SV: 23-39 ($N = 14$, mean 31.7). HW: 14-17 ($N = 13$, mean 6.0). TL: 131-175 ($N = 7$, mean 157).

Prefrontals separate; supraciliaries 7, rarely 8 ($N = 14$, mean 7.1). Palpebral disc large. Ear aperture usually smaller than palpebral disc, longer axis vertical with 9-11 sharp lobules around margin. Midbody scales rows 26-30 ($N = 13$, mean 28.0); mid-dorsal scales with smoothly curved

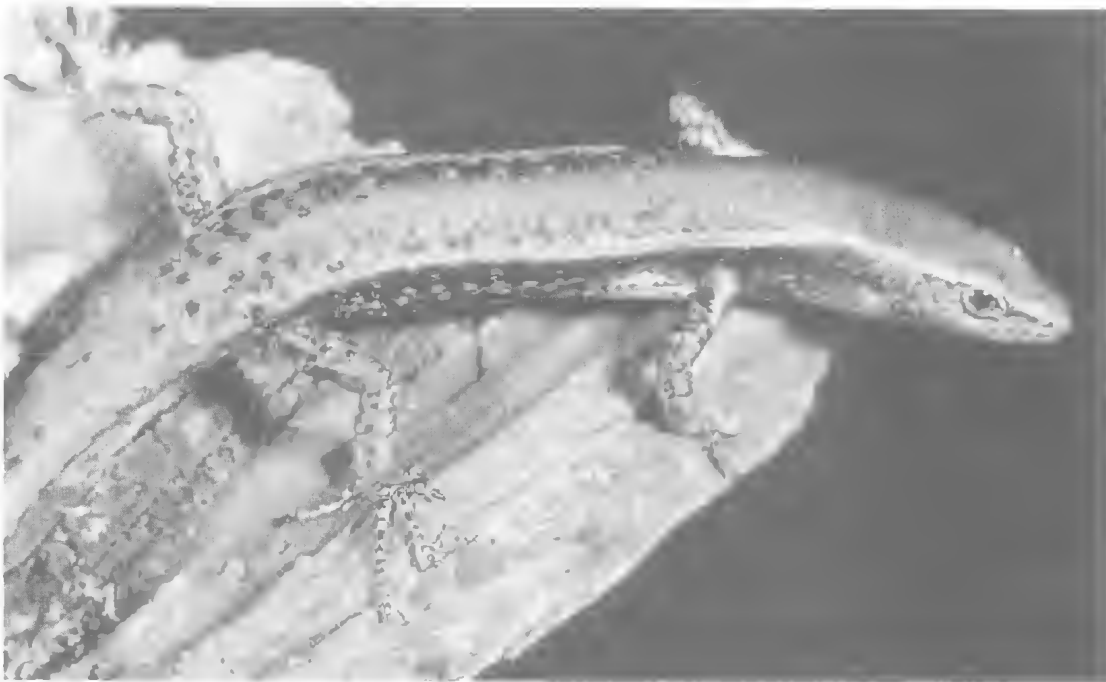


FIG. 33. *Carlia rimula*, 12.5km S of Coen, NEQ (Queensland Museum).

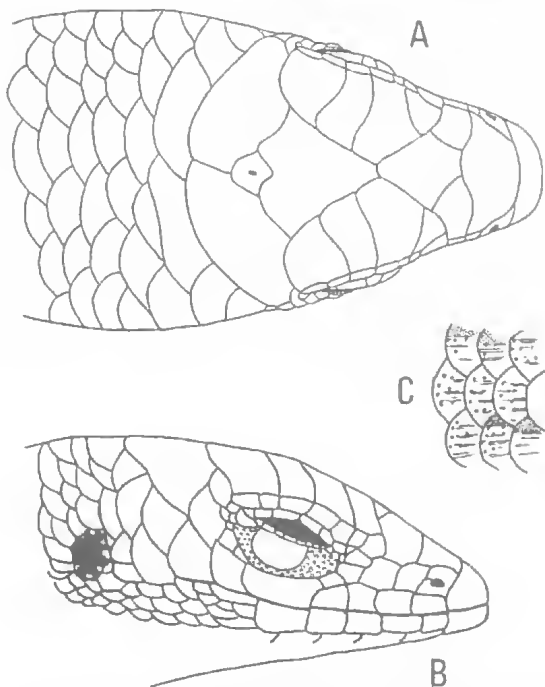


FIG. 34. *Carlia rimula* (QM J26280): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

posterior edges; dorsal and lateral scales have 4 to 5 weak carinations with each carination formed by a series of 2 to 5 smaller points. Lamellae under fourth toe 24-30 ($N = 13$, mean 27.4).

On upperparts, ground colour is brown-black, sometimes flecked with golden brown or white. Well defined gold-silver dorsolateral lines run from in front of and above the eyes to the tail. A similarly coloured midlateral line runs from behind the front legs to and along hindlimbs; and a distinct grey-brown vertebral line extends from the neck along the tail. Top of the head and neck are golden brown; sides of head and neck are lighter than the ground colour. Vertebral line may be poorly defined, but the dorsolateral line is always well defined and is sometimes indented with black-brown. In large males, the midlateral line may be absent or represented by golden flecking. Ventrally cream; feet black.

HABITAT

Rocks and associated leaf-litter in open vine-forest, usually along creeks.

REMARKS

Covacevich *et al.* (1982) concluded that *C. rimula* was a rare species.

***Carlia rostralis* (de Vis)**
(Figs 30,35,36)

1885 *Heteropus rostralis* de Vis. *Proc. Roy. Soc. Qd* 1:
171. Cardwell, NE Queensland. Holotype QM J230.

MATERIAL EXAMINED

QUEENSLAND: Gregory River (QM J231); Magnificent Creek, Kowanyama (QM J14130-6, 14138-50, 29295, 29372); Shiptons Flat (QM J22947); Collingwood, 5 km S of Home Rule (QM J24849); 12 km N of Palmer River on Cooktown Road (AM R92916, 97695-702); 10 km N of Palmer River (AM R56792); foothills, Mt Frazer (Q. J23456-8); 28.7 km NE of Cooktown Road via Windsor Tableland forestry road (AM R63917); Mt Molloy (WAM R 45609; AM R41345; QM J19338-9); Spear Creek, Mt Molloy (QM J27066); Crowley Creek, Mt Molloy (QM J27013); Bald Mt, near Mareeba (AM R26151); Davies Creek Road, 16 miles SE Mareeba (AM R53904); Black Mt Road, Kuranda (AM R47198-9); 3 km N of Kennedy Highway via Black Mt Road (AM R92915); Kuranda (AM R67086-90); Holloway Beach, via Casuarina Street (AM R97693-4); 9 miles N of Cairns (AM R66808); Tinaroo Dam (QM J11851); Herberton (AM R63846-7, 63858-62); Cardwell (QM J230); Hinchinbrook Island (QM J26112-3, 26120, 26340-1, 26367, 37941-2); Hencamp Creek, 5 km N of 1 km E of Roll-
ingstone (AM R89743-55, 97687-9); 24.1 km ESE of

Wallaman Falls National Park by road (AM R97690-2); Millstream National Park (AM R62276); 10 km W of Bruce Highway via Paluma Road (AM R97675-6); 1 km W of Moongobulla, 65.3 k NW of Townsville (QM J26618); 28.3 km WSW of Ross River Road in WSW Townsville via the Hervey Range Road (AM R97677-85); 29.1 km WSW of Ross River Road in WSW Townsville via Hervey Range Road (AM R89737-42, 97686); Hervey Range (QM J27618-9); no data (QM J2625, 2629-30).

DIAGNOSIS

A very large (maximum SV 70) *Carlia* with smooth or weakly tricarinated mid-dorsal scales with smoothly curved posterior edges; ear aperture vertically elongate, with large pointed lobules on anterior edge and sometimes smaller ones on other margins. Distinguished from *C. rhomboidalis* and *C. rubrigularis* by the presence of a free interparietal and from *C. longipes* by colour pattern (Males — boldly marked with black throat, black speckled back, black upper lateral stripe continuing to hindlimb and red lower lateral stripe vs comparatively drably marked with no black throat, with brown back, black upper lateral stripe continuing to forelimb, and red sides. Females — boldly marked with distinct white dorsolateral



FIG. 35. *Carlia rostralis*, Hinchinbrook Island, NEQ (Queensland Museum).

MEMOIRS OF THE QUEENSLAND MUSEUM

BRISBANE

© Queensland Museum
PO Box 3300, South Brisbane 4101, Australia
Phone 06 7 3840 7555
Fax 06 7 3846 1226
Email qmlib@qm.qld.gov.au
Website www.qm.qld.gov.au

National Library of Australia card number
ISSN 0079-8835

NOTE

Papers published in this volume and in all previous volumes of the *Memoirs of the Queensland Museum* may be reproduced for scientific research, individual study or other educational purposes. Properly acknowledged quotations may be made but queries regarding the republication of any papers should be addressed to the Editor in Chief. Copies of the journal can be purchased from the Queensland Museum Shop.

A Guide to Authors is displayed at the Queensland Museum web site

A Queensland Government Project
Typeset at the Queensland Museum

stripe and midlateral stripes continuing to behind forelimb vs same pattern as male *C. longipes*).

DISTRIBUTION

From Gregory River, NW Queensland, to NE Queensland from Kowanyama and Cooktown region in the north, south to the Townsville area.

DESCRIPTION

SV: 29-70 (N = 100, mean 49.6), HW: 14-19 (N = 69, mean 15.0). TL: 159-239 (N = 48, mean 184.7).

Prefrontals separate. Supraciliaries 7, rarely 6, 8, or 9 (N = 201, mean 7.1). Palpebral disc small, occupying about third of lower eyelid. Ear aperture usually larger than disc, and with large lobules on anterior margin and sometimes with smaller ones on other margins. Midbody scale rows 30-38 (N = 68, mean 34.1); mid-dorsal scales smooth to weakly tricarinated, with smoothly curved posterior edges. Lamellae under fourth toe 26-36 (N = 74, mean 30.8).

Colour and pattern varies between the two stages described below. In juveniles and females, dorsally brown with a few scattered black speckles and well defined dorsolateral lines from behind the eye continuing to behind the forelimb; lateral surface black from tip to snout to just behind forelimb with a well defined white midlateral line (this may be broken up into a series of dashes); labials flecked with black; posterior lateral half of body brown with or without a reddish tinge; white below. In males, brown above with intense black speckling or lines with a well defined white dorsolateral line from tip of snout, continuing for varying distances past forelimb; laterally a black stripe begins from nostril and terminates in front of hindlimb; lower lateral surface bright red in life (on neck this is often streaked with black); labials and chin yellow; ventrally white with black throat and neck.

HABITAT

C. rostralis is a ground-dweller in grasslands and woodlands but not in rainforests. However, it can be found in association with rocks and vine thickets.

REMARKS

C. rostralis encapsulates the difficult taxonomic problems in the *C. fusca* complex. Morphologically there is little difference between *C. longipes* and *C. rostralis*. In colour and pattern, they are very different. These differences probably play an important part in specific-mate recognition

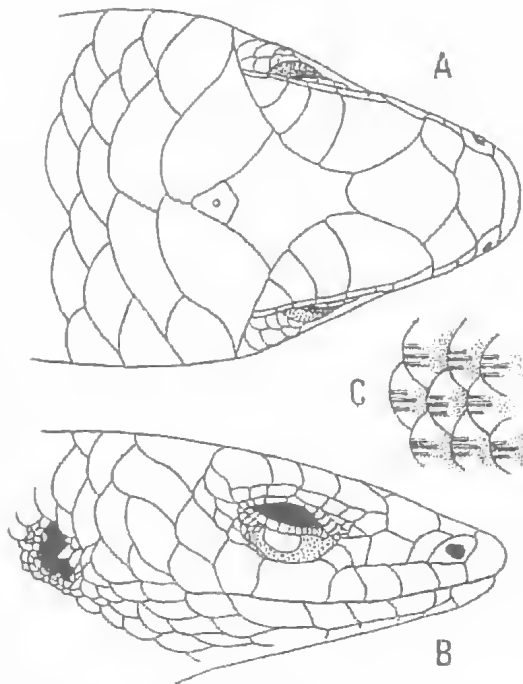


FIG. 36. *Carlia rostralis* (QM J14144): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

systems (e.g. during head bobbing and body posturing displays).

The holotype of *Heteropus rostralis* (QM J230) has faded and it is very difficult to see the pattern except under angled light. Even so, it is possible to identify it as a female of the taxon.

Wilhoft and Reiter (1965) probably studied the reproductive biology of this species. Unfortunately, they gave no details for their specimens.

Carlia rubrigularis sp. nov.

(Figs 3, 37, 38)

MATERIAL EXAMINED

HOLOTYPE: QM J29956, Innisfail, NE Queensland (17°32'S, 146°01'E), collected by D.C. Wilhoft on 18 April, 1960.

PARATYPES: Cooktown (AM R2271); Cooktown Lagoon (AM R41346); 27 km S of Cooktown (MV D13180); Big Tableland (SAM R9767); Home Rule (QM J25229, 25294, 25211); Home Rule, Slaty Creek (SAM R9757a-d); Home Rule Falls (QM J25141, 25212, 25293); Mt Hedley, Home Rule (QM J25240, 25242, 25245); Gap Creek, 12 mile Scrub (QM J25296-7); Mt Hartley (QM J25143, 25146, 25246-50, 25272); Shiptons Flat (QM J17826, 17901, 17906-7, 24649, 24800, 24807-8); Bloomfield River Scrub, c. 40 km S of Cooktown (QM J22668);



FIG. 37. *Carlia rubrigularis* sp. nov., Thornton Peak, NEQ (Steve Wilson).

Horan Creek, Mt Finnigan (QM J25209); track between Granite Creek and Cedar Bay (QM J25198-200).

OTHER SPECIMENS EXAMINED: QUEENSLAND: Marina Plains (QM J22945); Mossman Gorge (AM R20774-5); Mossman (AM R17118; MCZ 9132); Port Douglas (SAM R3893a,b); Mt Lewis (AM R28384-5); Rifle Creek, Mt Molloy (QM J25109); Mt Molloy (QM J 19416); Palmerston, Atherton Tablelands (AM R20204-6); Green Island (AM R36609); Kuranda (AM R21316); Cairns (AM R760-4); Tinaroo Dam (QM J11874); Tolga Scrub, Atherton (AM R41347-50); Russell Island (AM R36651-2, 36655-6, 36658-9); Lake Barrine (AM R16143; MCZ 35482-3); Atherton (AM R10834); Curtain Fig Tree, Yungaburra (AM R20200-3); The Crater, Mt Hypipamee (SAM R2981); Lake Eacham (QM J11875, SAM R2960-1, 2963-4); Mt Bartle Frere (AM R3980); Cucania (MCZ 35481); Crater, Atherton Tableland (QM J11873); Flying Fish Point (QM J14116-8, 14120-9, 22667, 25451; WAM R45614); Innisfail (QM J2492-9, 11876, 17433; SAM R2965, 2989); 17 km W of Innisfail (QM J17885-9). Johnstone River, Innisfail (QM J17890-1); South Johnstone River (AM R16333); Mt Garnet (AM R21321); Tully Falls (AM R16693-4); Sugar Cane Creek, Mission Beach (QM J24809); Tully (SAM R2952-62); Barrets Lagoon, 9.6 km E of Euramo (QM J17904); Kirrama Range, 12.8 km NW of Cardwell (AM R37492); Herbert River Gorge (QM J7785-7, 13867-8, 25062-5); 11.7 km S of Ingham (QM J26550-2), Paluma, Mt Spec (QM J26595-6).

DIAGNOSIS

A large (maximum SV 60) *Carlia* with smooth

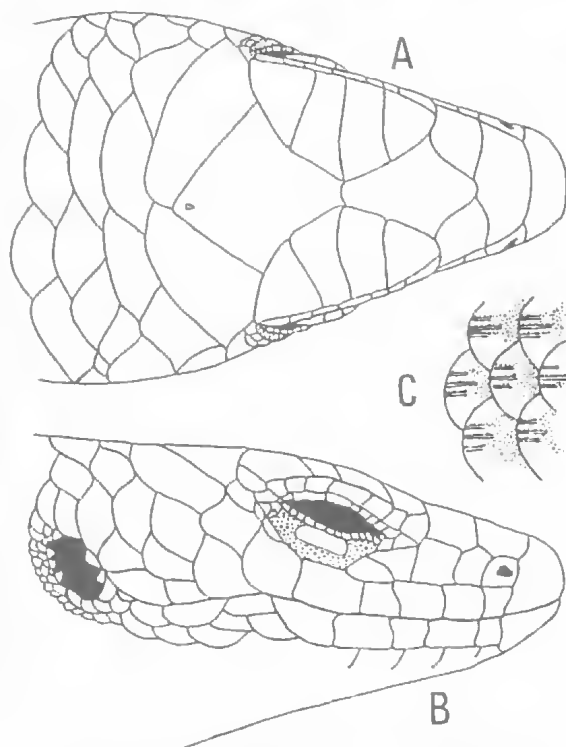


FIG. 38. *Carlia rubrigularis* sp. nov. (QM J24649): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

mid-dorsal scales with smoothly curved posterior edges. Distinguished from all other *Carlia* species in having the interparietal fused with the frontoparietal scale. Distinguished from *C. rhomboidalis* by throat and neck colour (pink vs blue and pink).

DISTRIBUTION

Rainforests of the Cooktown district, south to the Townsville area. Also Green, Russell, and Hinchinbrook Islands.

DESCRIPTION

SV: 22-60 (N = 135, mean 44.3). HW: 13-18 (N = 122, mean 17.0). TL: 117-182 (N = 40, mean 156.5).

Prefrontals separate, interparietal fused to frontoparietals, very rarely free. Supraciliaries 7, occasionally 6 or 8, rarely 9 (N = 142, mean 7.0). Palpebral disc small, occupying about half of lower eyelid. Ear aperture round, usually with one or two large pointed lobules on anterior margin and smaller pointed ones around edge. Midbody scale rows 28-37 (N = 123, mean 32.3); mid-dorsal scales smooth with smoothly curved posterior edges; scales with low tubercles in young. Lamellae under fourth toe 24-35 (N = 113, mean 29.2).

Colour and pattern as for *C. rhomboidalis* but juveniles and adults of *C. rubrigularis* have pink throats, necks, and lower sides of head.

HABITAT

Rainforest and its margins.

REMARKS

There is one specimen of *C. rubrigularis* in the

Queensland Museum collection from 'Marina Plains', 160km NW of Cooktown (J22945). We regard this as a doubtful record in the light of recent field work because the most northern known populations of *C. rubrigularis* occur in the Shiptons Flat-Home Rule rainforest, 30 km south of Cooktown, and there is no rainforest habitat 'suitable' for *C. rubrigularis* on Marina Plains, which is an area of salt pans and open grassland.

Wilhoft (1963a,b) has studied the reproductive biology of this species.

ETYMOLOGY

The name is from the latin that means 'red throat'.

Carlia rufilatus Storr (Figs 17,39,40)

1974 *Carlia rufilatus* Storr. *Rec. West. Aust. Mus.* 3: 157. Tumbling Water, Northern Territory. Holotype WAM R23271.

MATERIAL EXAMINED

WESTERN AUSTRALIA: 37km SE of Kununurra (QM J23973-4).

NORTHERN TERRITORY: Darwin (QM J2619-20, 7789; AM R20221); Port Darwin (QM J13687); Darwin airport (AM R52109, 52111); Mandorah, Darwin Harbour (AM R52108); Millner, Darwin (NTM 2433, 3302); 66 km S of Darwin (NTM 1812).

DIAGNOSIS

A very small (maximum SV 42) *Carlia* with hexagonally shaped and moderately tricarinate mid-dorsal scales and with longer axis of ear aperture horizontal. Distinguished from *C. gracilis* by



FIG. 39. *Carlia rufilatus*, Casuarina, NT (Steve Wilson).

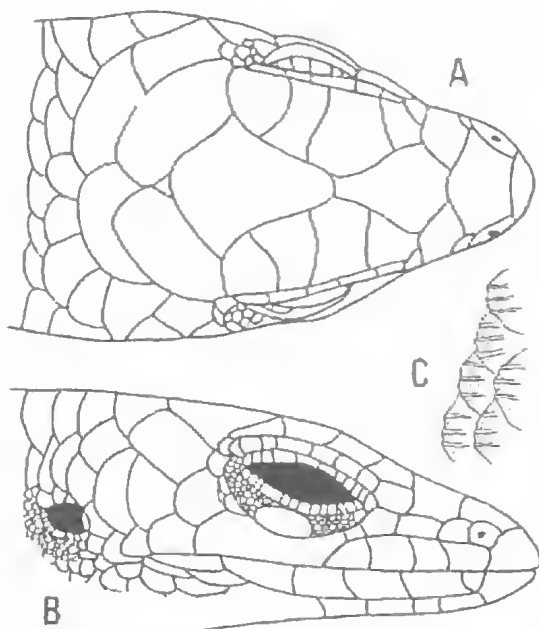


FIG. 40. *Carlia rufilatus* (QM J13687): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

larger palpebral disc (much more than half of eyelid vs about half of eyelid); from *C. munda* by stronger dorsal keels and angular, less rounded posterior edges of dorsal scales, from both *gracilis* and *C. munda* by more numerous supraciliaries (usually 7 or 6 vs usually 5); and from *C. jarnoldae* by coloration and pattern (juvenile and female — whitish stripe from under eye to ear and occasionally to foreleg vs distinct white line outlined in black from eye to hind leg; breeding male — red mid-lateral stripe vs 5 to 7 dark blue dorsal stripes, and with white flecked, thick dark blue upper lateral stripe with a red stripe below this).

DISTRIBUTION

Northwestern Northern Territory in vicinity of Darwin; far northern Western Australia in East and West Kimberley (Storr, 1974).

DESCRIPTION

See Storr (1974: 157).

HABITAT

'*C. rufilatus* is found in the leaf litter of moderately dense forests and woodlands (*Eucalyptus*, *Melaleuca*, *Pandanus*, *Acacia*, *Adansonia* etc.)' (Storr, *in litt*).

REMARKS

This species is similar to *C. jarnoldae*. The Northern Territory population of *C. rufilatus* closely resembles *C. jarnoldae* morphologically and meristically but pattern and colour differences are marked.

Carlia schmeltzii (Peters) (Figs 3,42,43)

1867 *Heteropus schmeltzii* Peters. *Mber. K. preuss. Akad. Wiss.* p.23. Rockhampton. Holotype ZMB 5750.

1975 *Carlia prava* Covacevich and Ingram, 1975. *Vic. Nat.* 92: 22. Magnificent Creek, Kowanyama, N Queensland. Holotype QM J14101.

MATERIAL EXAMINED

QUEENSLAND: Rocky River (AM R16678); 3km N of Coen (QM J26275-6); Coen (AM R16342, 16525); Magnificent Creek, Mitchell River Mission (QM J14094-5, 14097, 14099-103; WAM R45613); Cairns (AM R54629); 10km W of Mareeba (AM R47193); 8.4km W of Lappa Junction (AM R16448); Brownsville Battery near Mt Garnet (AM R21320); 66.3km NW of Townsville (AM J26556); 1km W of Moongobulla (QM J26619-20); Magnetic Island (QM J24397-401; 24959); 36.3km SE of Townsville (QM J26661); Reid River, 60km S of Townsville (QM J26570); 66km S of Townsville (QM J25369); 50.3km NE of Charters Towers (QM J26588-91); Bowen (QM J25365-6); Charters Towers (QM J24277, 24827; WAM R21487); Dent Island (AM R49834); Lindeman Island (AM R11163; QM J5639); Brampton Island (AM R13536, 47180-1); 4km N of Sarina (QM J24841); Homevale (QM J33886, 33894, 33942, 33967-8); Oakey Creek, Homevale (QM J33911); Nebo Creek via Nebo (QM J33951); South Percy Island, Northumberland Group (QM J778); 'Langham', Arthur Point, Shoalwater Bay (QM J7881); Byfield (QM J25740, 25744); Yeppoon (AM R15678-9; QM J21669-70); Mt Etna (AM J25750); Rockhampton (QM J7790; ZMB 5750); Rundle Range (QM J33779-80, 33783, 33786, 33791, 33793, 33803-5, 33807, 33817, 33820-1, 33824, 33826, 33841, 33844, 33851, 33856); Mt Warro (QM J23849-50); 1.6km W of Bundaberg (QM J22011); Bundaberg (QM J22320); Goodnight Scrub, Burnett River (QM J24948); Walla-ville (QM J24356, 24358-9); Cordalba State Forest (QM J15713); Robinsons Gorge (QM J24126, 24338, 24361); Eidsvold (AM R6006); Arcadia Valley via Injune (QM J25902); Twin Mountain, Beerwah (QM J27350); Somerset Dam (QM J11850); Stockyard (QM J26999); Mt French (QM J23994); Mt Barney (QM J21671); Barney View, Mt Barney (QM J21990-2); Queensland (MV D2045).

DIAGNOSIS

A very large (maximum SV 69) *Carlia* with hexagonally shaped, bicarinate and/or tricarinate mid-dorsal scales; ear aperture vertically elongate usually with two large squarish lobules on anterior



FIG. 41. *Carlia schmeltzii*, Magnetic Island, NEQ (Queensland Museum).

border. Further distinguish from *C. pectoralis*, *C. triacantha*, *C. vivax*, *C. dogare* by its smaller palpebral disc (about half of lower eyelid vs much more than half) and more numerous supraciliaries (usually 7 vs 5 or 6).

DISTRIBUTION

Cape York Peninsula, from Coen in the north and Kowanyama on the west coast, eastern Queensland, south to the Queensland-New South Wales border, west to Charters Towers and the Carnarvon Range. Also Magnetic, Lindeman, South Percy, and Brampton Islands.

DESCRIPTION

SV: 26-69 ($N = 101$, mean 51.4). HW: 14-19 ($N = 95$, mean 16.6). TL: 160-214 ($N = 39$, mean 188.0).

Prefrontals separated, rarely touching. Supraciliaries 7, occasionally 6, rarely 4, 5 or 8 ($N = 185$, mean 6.8). Palpebral disc small occupying about half of lower eyelid. Ear aperture about same size as disc, longer axis vertical, with usually two large squarish lobules on anterior margin. Midbody scale rows 31-38 ($N = 82$, mean 34.7), mid-dorsal scales hexagonally shaped, strongly bicarinate and/or tricarinate. Lamellae under fourth toe 23-30 ($N = 92$, mean 25.9).

In adults, head and dorsal surface brown, with or without black dotting, grey dorsolateral stripe

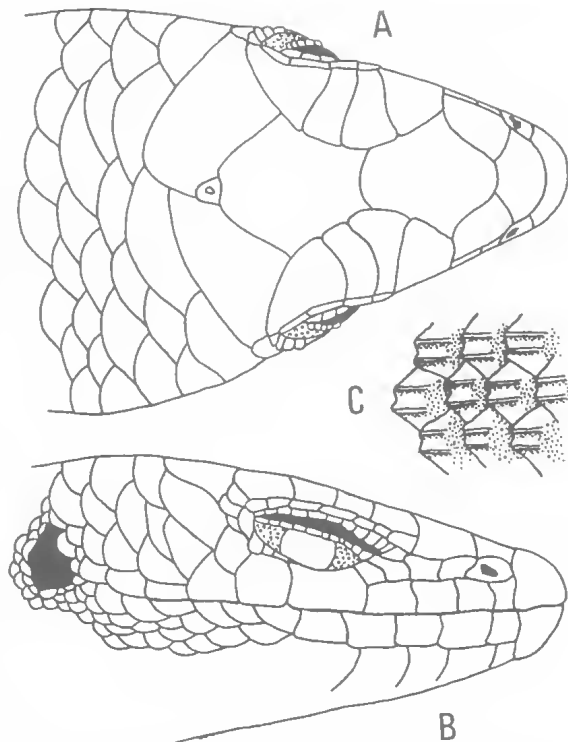


FIG. 42. *Carlia schmeltzii* (QM J14102): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

from above ear and along tail; lateral surface grey-brown, scales thickly edged in black; in front of forelimb, scales of upper lateral surface also edged in black, lower lateral surface grey, tail brown. In breeding males, sides red on lower surface, red flecked with black on upper surface, scales of labials and sides of neck and throat black-lined, with some black speckling on neck and throat. Juveniles are blackish grey, heavily flecked with white and with faint dorsolateral lines; head brown and labials cream.

GEOGRAPHICAL VARIATION

Northern specimens tend to be smaller, less robust, and patternless. South of the Townsville region nearly all are tricarinate mid-dorsally and, north and west of the Townsville region, most are bicarinate. In the Townsville region specimens with mixed bi- and tricarinate dorsal scales occur commonly with specimens having only bicarinate or tricarinate scales.

HABITAT

Grassy areas in open forest, woodland, and on rocky ridges; in southeastern Queensland usually in elevated country.

REMARKS

Mitchell (1953) considered *schmeltzii* a synonym of *Leiopisma fuscum fuscum* but *C. schmeltzii* differs from the *C. fusca* complex in having bi- or tricarinate, mid-body scales, two large squarish ear lobules, and in colour and pattern.

Covacevich and Ingram (1975) described *C. prava* from Kowanyama on the western side of Cape York Peninsula. These specimens were mostly bicarinate and patternless. Although we were familiar with *C. schmeltzii*, we did not compare this species with *C. prava* because *C. schmeltzii* (as it was then understood) was a very large, distinctly marked and coloured, tricarinate skink that apparently varied little. When specimens were collected recently between mid-eastern Queensland and Cape York Peninsula, it became obvious that carination, colour, and size



FIG. 43. *Carlia scirtetis*, Black Trevethan Range, 17km S of Cooktown, NEQ (Queensland Museum).

varied greatly, especially in the specimens from the Townsville region, and that differences used previously to diagnose the species could no longer be maintained. For these reasons it is apparent that *C. prava* is a junior subjective synonym of *C. schmeltzii*.

***Carlia scirtetis* Ingram and Covacevich**
(Figs 9,43,44)

1980 *Carlia scirtetis* Ingram and Covacevich. In Bailey, A. and Stevens, N.C., 'Contemporary Cape York Peninsula', p. 45. Black Mountain, Trevethan Range, NE Queensland. Holotype MV D12092.

MATERIAL EXAMINED

QUEENSLAND: Black Mountain, Black Trevethan Range (AM R26719-20; QM J21369-70, 25160, 25935; MV D12091-7, 16581); lower east side of Mt Simon, 'The Black Gap', Black Trevethan Range (AM R64155-68).

DIAGNOSIS

A large (maximum SV 64), dark *Carlia* with smoothly curved posterior edges to the mid-dorsal scales; dorsal and lateral scales mostly weakly tricarinate, with each keel broken into a series of 2-4 smaller points. Distinguished from *C. rimula* by large size (maximum SV 64 vs 39), high midbody scale count (40-45 vs 26-30) and colour and pattern; and from *C. coensis* by its pointed ear lobules, and dark unpatterned juveniles.

DISTRIBUTION

Known only from the exposed boulder mountains of the Trevethan Range, near Cooktown, NE Queensland.

DESCRIPTION

SV: 44-64 (N = 12, mean 53.8), HW: 15-19 (N = 12, mean 16.7). TL: 161-216 (N = 8, mean 181).

Prefrontals separate. Supraciliaries 7, rarely 6 or 8 (N = 9, mean 7.0). Palpebral disc small. Ear aperture usually equal to palpebral disc, longer axis vertical, with many long, pointed lobules around margin. Midbody scale rows 40-45 (N = 12, mean 42.1); mid-dorsal scales with smoothly curved posterior edges, dorsal and lateral scales having 3-4 weak carinations, each carination with a series of 2-4 smaller points. Lamellae under fourth toe 32-37 (N = 12, mean 34.1).

Upperparts dark brown-black with many paler scales, which are sometimes grouped to give the suggestion of faint dorsolateral and vertebral stripes; hind and forelimbs spotted with pale blue; tail with diffuse pale brown dorsolateral lines. Underparts dark; ventral scales bluish and lined in

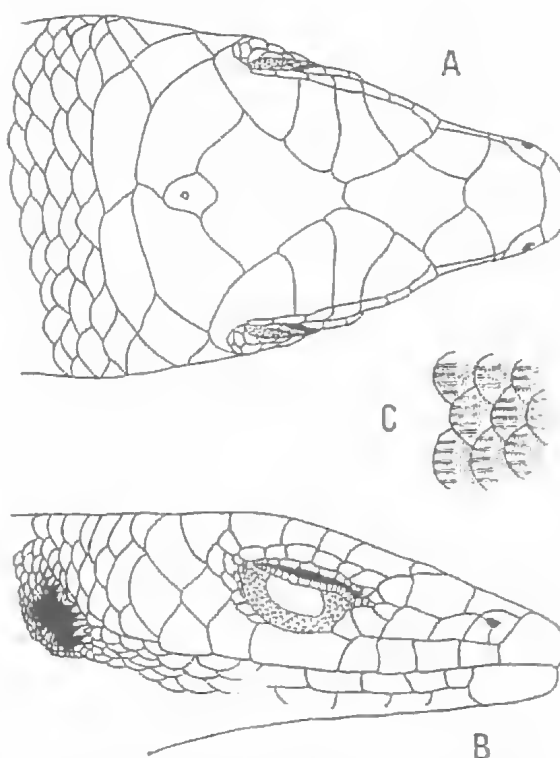


FIG. 44. *Carlia scirtetis* (QM J21370): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

brown; throat, chin, limb and tail scales have heavy brown flecking; undersides of feet black.

HABITAT

Bare black boulders.

REMARKS

Covacevich *et al.* (1982) concluded that *C. scirtetis* was a rare species.

***Carlia storri* sp. nov.**
(Figs 6,45,46)

1981 *Carlia storri* Kikkawa, Monteith, and Ingram, p. 1720 (*nomen nudum*).

MATERIAL EXAMINED

HOLOTYPE: QM J24656, Dulhunty River Crossing on Telegraph Road, 110 km S of Bamaga, Cape York, N Queensland (11°50'S, 142°30'E), collected by G.J. Ingram, on 28 September, 1974.

PARATYPES: Murray Island (AM R4508, 44224); Thursday Island (MV D4332); Red Island Point (QM J24639-40); 1.5 km N of Bamaga airport (AM R38643-4, 38646); Lake Boronto (QM J25600); Shotgun Creek crossing (QM J26256); Heathlands (QM J26222);



FIG. 45. *Carlia storri* sp. nov., Chillagoe, NEQ (Steve Wilson).

Dulhunty River crossing (QM J24653-5, 24657-8, 24683-5); Wenlock River at Moreton (AM R38642); 3 km E of west Claudie River on Iron Range road (QM J24691); Iron Range (QM J25429); Claudie River (MV D675, 677-9); Pascoe River crossing on Iron Range Road (QM J24676); 2 km up Lankelly Creek from Coen bridge (QM J26269); 17 km E of Hopevale Mission (QM J17804, 17895-6); Endeavour River (SAM R9746, 9753); Bloomfield River crossing Cooktown (WAM R45606); 5 km S of Cooktown (QM J25312); Shiptons Flat (QM J17908).

OTHER SPECIMENS EXAMINED: PAPUA NEW GUINEA: Maka, Lake Murray (SAM R10557); Balimo, Aramia River (AM R23908, 23913, 23924, 23944, 23970-1, 23973-4, 23977-9, 23981-3, 23987, 23990, 23992-4, 24001, 24005, 24009, 24029-20, 24027-8, 24031-4, 24038, 24044, 24046, 24058, 24060, 24071, 24073, 24081-2, 24085, 24091, 24096, 24108, 24111, 24116-8, 24124, 24128, 24131-4, 24136-7, 24139-40, 24144-6, 24161, 24169, 24172, 24179-80, 24189, 24190; MV D14424; SAM R10292a,b); Extension Station, Oriomo River (AM R23684-5); Daru Island (AM R30663, 30666, 30668, 30672-83, 30699; MV D14483-7, 14497; SAM R10257, 10282, 10288, 10290); Boze, Binatur River (SAM R10556a,b); Sigabadura, West District (AM R40790-1).

QUEENSLAND: Cooktown junction on Mossman to Cairns road (AM R38637); Port Douglas (SAM

R2971a,b, 2976); Mt Frazer (QM J23452, 23454); Mt Molloy (AM R47191; QM J17816, 19409, 19419); 17.7 km S of Mt Carbine (AM R16322); Palm Beach near Cairns (QM J11852; SAM R2974, 2979-80, 2985-7); 22.5 km S of Mt Carbine (AM R38638-40); Cairns (QM J15799, 25550; SAM R2973, 2977, 2983); Rocky Creek between Atherton and Mareeba (QM J18035); 11 km S of Mareeba (AM R26099, 26106); Tinaroo Dam (QM J11582); 8 km S of Gordonvale (AM R26632); Bellenden Ker (QM J579-90); Dunk Island (QM J7779); 14.3 km N of Cardwell (QM J26600); 25.9 km N of Ingham (QM J26601); Hinchinbrook Island (AM R9587; QM J26342); Herbert Gorge (QM J2464-5); 66.3 km NW of Townsville (QM J26557-8); 19.9 km S of Ingham (QM J26607-9); 1.6 km W of Moongobulla (QM J26626-34); 54.3 km NW of Townsville (QM J26567-8); between Townsville and Argea (AM R47192); 29.3 km NW of Townsville (QM J26553-4, 26603).

DIAGNOSIS

A small (maximum SV 46) *Carlia* with strongly bicarinated and hexagonally shaped mid-dorsal scales. Ear aperture with short to long acute lobules around margin. Distinguished from the Timorese *C. spinauris* (data from Greer, 1976) by

more numerous lamellae under fourth toe (usually 27-33 vs 21-25) and dorsal and lateral scales bicarinate; from *C. mundivensis* and *C. johnstonei* by fewer supraciliaries (usually 6 vs 7) and fewer midbody scale rows (27-33 vs 34-42 and 34-38 respectively); from *C. bicarinata* by colouration and pattern (Breeding male; pale brown with orange legs and tail vs dark brown dorsally, laterally, and on limbs, with a red midlateral stripe and white flecking. Females and juveniles; white midlateral, dorsolateral, and pale vertebral lines, the latter two enclosing two darker paravertebral stripes vs white midlateral, dorsolateral and pale paravertebral lines, the latter two enclosing darker vertebral and laterodorsal stripes).

DISTRIBUTION

SW Papua New Guinea, Torres Strait Islands and Cape York Peninsula, south to Townsville. Also, Daru, Dunk and Hinchinbrook Islands.

DESCRIPTION

SV: 21-46 (N = 207, mean 38.7). HW: 12-18 (N = 201, mean 15.0). TL: 141-236 (N = 75, mean 189.0).

Prefrontals separate, rarely contiguous along midline. Supraciliaries usually 6, but commonly 5 or 7. (N = 204, mean 5.9). Palpebral disc small. Ear aperture round, equal to or smaller than

palpebral disc, with short to long acute lobules around margin. Midbody scale rows 27-33 (N = 188, mean 30.1); mid-dorsal scales hexagonally shaped and strongly bicarinate. Lamellae under fourth toe 27-33 (N = 184, mean 30.3).

Colour and pattern varies between two extremes described below. Female: greenish brown to pale brown ground colour, with well defined pale dorsolateral lines from above and behind eyes to along tail; a distinct pale vertebral line from neck to base of tail, and pale midlateral line from above and behind forelimbs to just in front of hindlimbs; dark paravertebral stripes with light speckling; lower lateral surface pale; head coppery brown. Breeding male: pale brown with no pattern and with orange tail and legs. Ventrally white.

In all phases there is a white spot at the posterior base of the thigh which is sometimes connected to a white line that continues along the thigh.

HABITAT

Lowlands, grassy areas in open-forest, woodland and sea shores.

ETYMOLOGY

Named for Dr Glen Storr of Western Australian.

Carlia tetradactyla (O'Shaughnessy) (Figs 25, 47, 48)

1879 *Mocia tetradactyla* O'Shaughnessy. *Ann. Mag. Nat. Hist.* (5) 4: 300. Queensland? Holotype BMNH 1946.9.17.43.

1890 *Lygosoma maccooyi* Ramsay and Ogilby. *Rec. Aust. Mus.* 1: 8. Brawlin, N.S.W. Lectotype AM R685 (here designated).

MATERIAL EXAMINED

QUEENSLAND: Kaimkillenbun (AM R11676); Oakley (QM J23997-8, 24053); Cecil Plains (QM J26939); Toowoomba (QM J2631-2); Jolly Falls (QM J21957, 26666); N of Girraween National Park (QM J22762); Storm King Dam (QM J27907-8); Stanthorpe District (QM J21758); 8.5km S of Stanthorpe (QM J11847); 6.4km N of Wallangara (QM J23909); Wyberba (QM J11848); Queensland? (BMNH 1946.9.17.43).

NEW SOUTH WALES: Bruxner Highway, 35km W of Tenterfield (MV D38912); Tenterfield (AM R13121-2); 21km W of Tenterfield (QM J24052); Tamworth (AM R15099); Warrumbungle Mountains (AM R14982, 15573); Coonabarabran (MV R14529); Dubbo (QM J7775-7); Guntawang (AM R4016); 20km W, 16km S of Singleton (AM R49187); 42km W, 18km S of Singleton (AM R49189); Kandos (AM R47195); Turondale (AM R33198); 2km W of Molong (AM R47194); Capertee (AM R27385); Limestone Creek, 11km S of Lyndhurst (MV D14530-1); Brawlin (AM R671-2, 676-7, 683-6, 797,

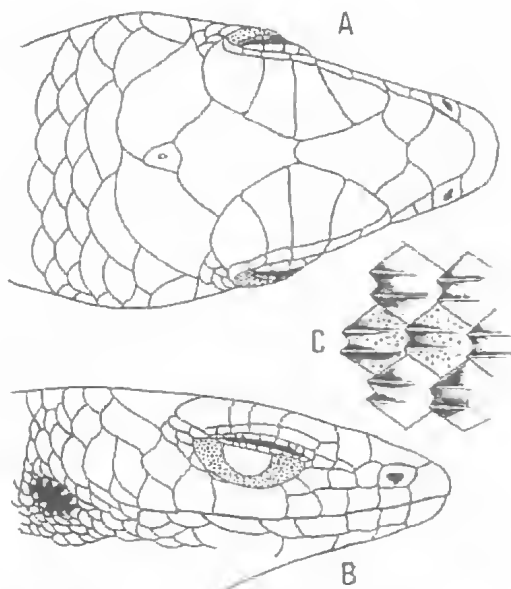


FIG. 46. *Carlia storri* sp. nov. (QM J25600): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.



FIG. 47. *Carlia tetradactyla*, Oakey, SEQ (Queensland Museum).

802, 834-5, 921; BMNH 1946.8.17.76-8); Cootamundra (MCZ 6304); 21km NE of Tarcutta (MV D14528); 17km NE of Tarcutta (MV D14527); 6.4km NE of Tarcutta (MV D14525-6); Tarcutta (MV D14522-4); Pedro River, Moruya (AM R49103, 49105); 17km N of Albury (MV D14636-7); 'Nuruanny', Murrumbidgee (MV D827).

VICTORIA: Barnawatha (AM R4131); Warby Range (MV D14399); Beechworth (MV D42894); 3.2km N of Taminick Gap (MV D14576); Taminick Gap (MV D14563); 1.6km E of Taminick Gap (MV D14616); Benalla (AM R897-8); Victoria (MV D652, 1723); no Data (AM R956).

DIAGNOSIS

A large (maximum SV 64) *Carlia* with smooth or striate mid-dorsal scales with smoothly curved posterior edges; ear aperture round with rounded lobule on anterior margin. Further distinguished from *C. longipes* by lower number of lamellae under fourth toe (usually less than 25 vs usually 27 or more); from *C. munda* by higher number of supraciliaries (usually 7 vs 5), from *C. rhomboidalis* and *C. rubrigularis* by its free interparietal, and from all these species by coloration and pattern.

DISTRIBUTION

Southeastern Queensland to northern Victoria on the western slopes of the Great Dividing Range,

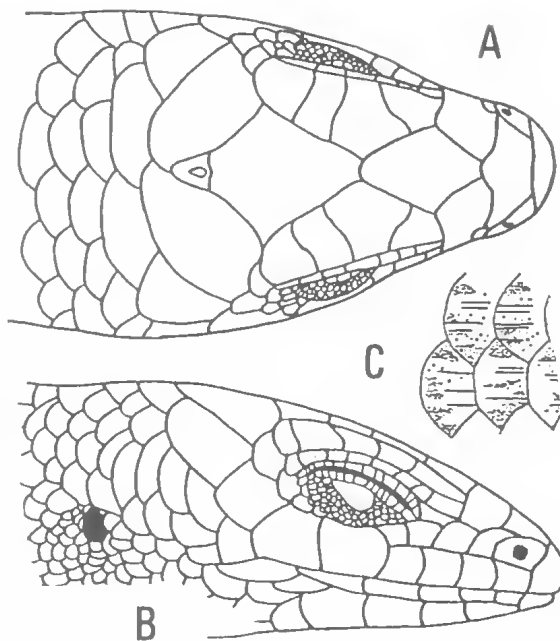


FIG. 48. *Carlia tetradactyla* (QM J21957): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

from Oakey and Cecil Plains in Queensland to Benalla, Victoria. In New South Wales, west to the Warrumbungles, Dubbo, and Cootamundra.

DESCRIPTION

SV: 25-64 (N = 72, mean 49.1). HW: 14-18 (N = 65, mean 16). TL: 30-119 (N = 28, mean 151).

Prefrontals usually separate but touching or forming a median suture in 10% of specimens. Supraciliaries 7, rarely 6 or 8 (N = 134, mean 7.0). Palpebral disc small. Ear aperture round, equal to or smaller than palpebral disc, with usually a larger rounded lobule on the anterior edge with smaller ones on other margins. Midbody scale rows 29-34 (N = 70, mean 31.2); mid-dorsal scales smooth, often striated, and with smoothly curved posterior edges. Lamellae under fourth toe 18-27 (N = 69, mean 22.3).

Ground colour olive-grey; thick dark vertebral stripe from neck to along tail with 2-4 lines of white dotting; a dark stripe along upper lateral surface; upper and lower labials white; in juveniles, a white stripe from ear to above fore limb; bluish-white ventrally. In breeding males two burnt-orange upper and lower lateral stripes between fore limb and hind limb.

HABITAT

Grassy areas in open forest, woodland, and cultivation.

REMARKS

Mitchell (1953) considered *Leiolopisma* *maccooei* (Ramsay and Ogilby) distinct from *L.*

tetradactyla (O'Shaughnessy), giving the separation of prefrontals as the distinguishing feature. Examination of the holotype of *Mocoo tetradactyla* (BMNH 1946.8.17.43) shows that the prefrontals nearly touch. Similarly one of the specimens (QM J2632) examined by Mitchell has prefrontals that are only barely separated. Examination of the twelve syntypes (BMNH 1946.8.17.76-8; MCZ 6304, AM R672, R676-7, R683-6) of *Lygosoma maccooei* confirm Coventry's (1971) suggestion that they and the holotype of *Mocoo tetradactyla* were conspecific. We have chosen AM R685 as the lectotype of *Lygosoma maccooei*.

Carlia triacantha (Mitchell)

(Figs 30,49,50)

1953 *Leiolopisma triacantha* Mitchell. *Rec. S. Aust. Mus.* 11: 88. Adelaide River, Northern Territory. Holotype SAM R2697.

MATERIAL EXAMINED

WESTERN AUSTRALIA: Prince Regent River National Park (WAM R46815, 46817, 46839, 46809, 46965, 46967, 46971, 46763-6, 46742-57, 47243, 46889-90, 46993-4, 47004, 47012, 46950); Drysdale River National Park (WAM R50468-9, 50471, 50555).

NORTHERN TERRITORY: Port Darwin (QM J13690); Adelaide River (SAM R2697); 64km S of Darwin (NTM 1813); Mt Doreen, 59.6km W of Yuendumu; 5.5km N of Pine Creek (NTM 3093-7); Ban Ban Springs (NTM 3133); Katherine (NTM 2174); 32.1km W of Rabbit Flat (NTM 1513); Barrow Creek Roadhouse (AM R52087); Mt Olga (AM R17497).



FIG. 49. *Carlia triacantha*, Manning Ck, WA (Steve Wilson).

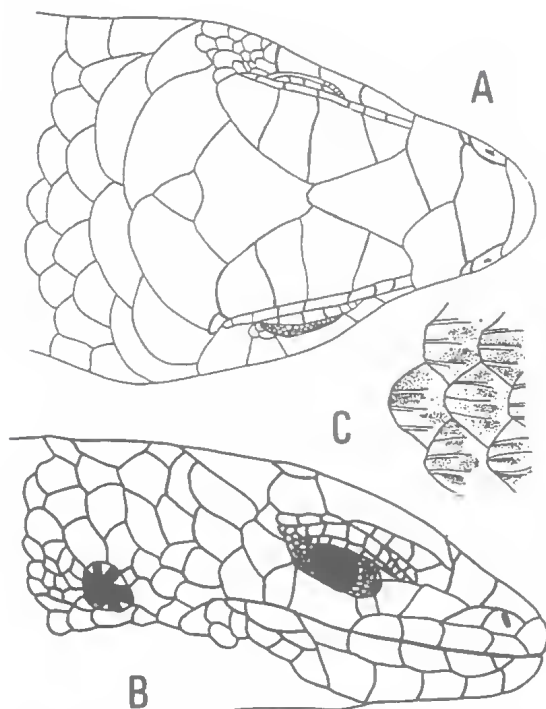


FIG. 50. *Carlia triacantha* (QM J13690): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

DIAGNOSIS

A medium sized (maximum SV 53), robust, *Carlia* with prefrontals usually contacting and forming a suture; mid-dorsal scales usually tricarinate, tending to be tricuspidate, 'quadrangularly' shaped, and irregularly aligned. Further distinguished from *C. pectoralis* and *C. gracilis* by larger number of supraciliaries, (usually 6 vs 5) and also from the latter by its larger palpebral disc (much more than half of eyelid vs about half of eyelid).

DISTRIBUTION

Western Australia north of 23°S, including many continental islands, and the greater part of Northern Territory (see Storr, 1974).

DESCRIPTION

See Storr (1974: 159).

HABITAT

'*C. triacantha* is the *Carlia* of sandstone/spinifex. It has also been found among other rocks, on sand and in termitaria. Its adaptation to dry sites has enabled it to penetrate southwards into the Pilbara and Central Australia' (Storr, *in litt*).

Carlia vivax (de Vis) (Figs 12,51,52)

1884 *Myophila vivax* de Vis. *Proc. Roy. Soc. Qd* 1: 77. Syntypes missing, from Brisbane, Queensland. Neotype, here designated, QM J24176, from Mt Coot-tha, Brisbane, Queensland.

1885 *Heteropus blackmanni* de Vis. *Proc. Roy. Soc. Qd* 1: 168. Port Curtis, Queensland. Lectotype QM J19985 (here designated).

MATERIAL EXAMINED

QUEENSLAND: Prince of Wales Island (AM R46239, 46244, 46249, 46255, 46301, 46314, 46316, 46486, 46614); Horn Island (QM J25493, 25495, AM R59139-41); Coen airfield (AM R16172); 3 km N of Coen (QM J26273); Coen (AM R16526, 38641); 13 km SW of Coen (QM J26285); Melville Range (QM J20514); 3.2 km from Wakooka on Cape Melville Road (QM J20764); Magnificent Creek, Kowanyama (QM J14104, 14106-8, 14110-5; WAM R51177-8); Laura River (QM J11158-60); Low Island (QM J7772); 17 km S of Mt Carbine (AM R16323-4); 22.5 km S of Mt Carbine (AM R38636); Mt Molloy (QM J11713-20, 19415); Stannary Hills (QM J7780-1); Lappa Junction (AM R16673); 23.2 km E of Woodstock (QM J26578); Lindeman Island (AM R9940, 11166, 11168, 47162-4, 47179; QM J5640-1); Homevale (QM J33978); Nebo Creek via Nebo (QM J33943, 33949-50, 33952-60, 33962-3); Curtis Island (QM J24219-20, 24225, 24231, 24238, 24254); Rundle Range (QM J33755-8, 33761-5, 33787, 33790, 33814, 33832, 33834, 33847-8, 33850, 33852); Port Curtis (QM J7773, 19970, 19973, 19980, 19982-5, 19989-90); Gladstone (AM R10078); 12 mile creek N of Bororen (QM J11707, 11710, 11712); 11 km S of Miriam Vale (QM J11731); Warro State Forest (QM J23796, 23839, 23842-5) 9.6 km S of Lowmead (QM J23864); Burnett Heads (AM R49840-1); Bundaberg (QM J22002, 22007, 22319, 22321-2); 5 km SE Carnarvon National Park (QM J24181); Burnett Heads (AM R49840-1); Goodnight Scrub, Burnett River (QM J24949); Coomboo Lake, Fraser Island (QM J22059); 48 km NW of Taroom (QM J24125); Toogoom via Torbanlea (QM J6326, 6328, 6330, 6332); Eidsvold (AM R6007); Upper Burnett River (AM R5494); 40.2 km from Gayndah (QM J11730); Murphys Lake, Taroom (QM J11736); 22.5 km NW of Injune (QM J17726-7); Cooloolia (QM J22474-5, 22481, 22484, 22972, 24178-9, 24183, WAM R45603, 44997-45001); Goomeri (QM J11729; WAM R45604); Noosa Heads (QM J1705, 7806, 11706); Chinchilla (QM J25959); Caloundra (QM J11764); Bribe Island (QM J21759-64); Burpengary (QM J9080); Virginia (QM J21953); Moreton Island (QM J22277, 24175); Pine Rivers (QM J2480-1); Petrie (QM J22671-3, 22676); 8 km N of Wivenhoe (QM J11756-9); Mt Glorious (QM J11743-6); Pt Lookout, N Stradbroke Island (QM J21979, 21984, 24167-8; WAM R45003); Brown Lake, Stradbroke Island (WAM R45002); Brisbane area (QM J1308, 1708, 1711, 2852, 11711, 11724, 11740-2, 11747-51, 11755, 11760-1, 21398, 21950-2, 21974-6, 21986-7, 22006, 22313, 22317, 24003, 24176-7, 24180, 24182, WAM R45005); Lake Manchester (QM



FIG. 51. *Carlia vivax*, Fraser Island, SEQ (David Knowles).

J11725); Myora Springs (QM J24090-2); Peel Island (QM J22367); Brown Lake (QM J24166); 3.2 km W of Mt Crosby (QM J11752-4); Mt Crosby (QM J22718); Daisy Hill (QM J24171-3); between Marburg and Rosewood (QM J11737); Dinmore (QM J22020); Beenleigh (QM J21948); 6.4 km S of Logan Village (QM J13536); Redbank Plains (QM J2853); 3.2 km E of Flinders Peak (QM J11738-9); Tamborine (MV D15307-8); Cedar Creek Falls, Mt Tamborine (QM J11708-9); Mt Tamborine (QM J11762-3); Boonah (QM J11721-2); 12 km S of Nerang (QM J24184); Barney View near Mt Barney (QM J21993-6, 21999); Warwick (QM J13169); Emu Vale (QM J13349-50); Fletcher (MV D124); Texas Caves area (QM J25916-20); Texas (QM J24001); Queensland (MV D1248, 2036).

NEW SOUTH WALES: Ashford (QM J24000); Maclean (AM R15187); 29 km S of Singleton on Putty Road (QM R46015).

DIAGNOSIS

A small (maximum SV 47) *Carlia* with hexagonally shaped and bicarinate mid-dorsal scales; with ear aperture vertically elongate usually with one large rounded anterior lobule. Further distinguished from *C. schmeltzii* by fewer supraciliaries (usually 5 vs 7); from *C. amax* by fewer supraciliaries (usually 5 vs 6); and from *C. pectoralis* pectoralis by less robust shape, pattern and coloration (female and juvenile with white midlateral and dorsolateral lines vs midlateral line only; breeding male with light coloration, bluish throat and side of head, and laterally suffused with pink or with a broad pink midlateral line, vs throat, labials, ventrolateral part of head scales heavily lined in black, with a red upper and lower lateral stripe

which may be broken up into dots); and from *C. p. inconnexa* by colour and pattern, which is heavily black-blotched in females and, in breeding males, black striped longitudinally on the dorsum. For difference from *C. dogare* see diagnosis of that species.

DISTRIBUTION

Prince of Wales and Horn Islands in the Torres Strait, Cape York Peninsula, south to Kowanyama in the west and Mt Molloy in the east through eastern Queensland and New South Wales to Singleton, ME New South Wales; west to Carnarvon Range and Texas in Queensland. Also on Low, Lindeman, Fraser and Moreton Bay islands.

DESCRIPTION

SV: 23-47 (N = 249, mean 37.7). HW: 11-20 (N = 244, mean 15.0). TL: 154-237 (N = 75, mean 193.8).

Prefrontals separated. Supraciliaries 5, rarely 4, 6 or 7 (N = 520, mean 5.0). Palpebral disc very large. Ear aperture smaller than disc, longer axis vertical, usually with one enlarged lobule on anterior margin. Midbody scale rows 23-34 (N = 254, mean 29.7); mid-dorsal scales hexagonally shaped and bicarinate. Lamellae under fourth toe 20-31 (N = 252, mean 25.4).

Colour and pattern vary between the two extremes described below. Juveniles and female — light brown with well defined midlateral and dorsolateral white stripes, often with a paravertebral

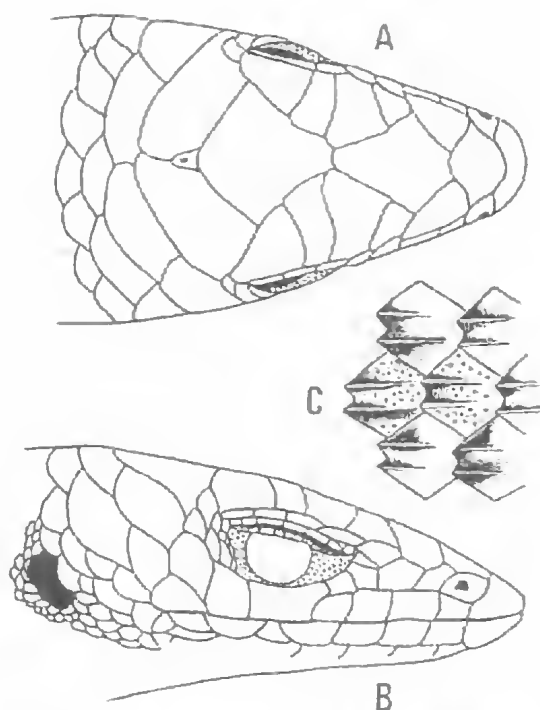


FIG. 52. *Carlia vivax* (QM J14114): A, Dorsal view of head. B, Lateral view of head. C, Mid-dorsal body scales.

series of darker ocellations. Breeding male — light brown with sides suffused with pink or with a thick pink midlateral line; throat blue, specked with dark brown.

GEOGRAPHICAL VARIATION

C. vivax generally exhibit decreases in size and number of midbody scale rows and increases in number of lamellae under fourth toe with decreasing latitude. Pattern varies little over its range but northern Queensland specimens have very distinct, wider, midlateral and dorsolateral white stripes with brown pigments on lateral surface sharply delimited from the white ventral surface.

HABITAT

Grassy areas in open forest, woodland, and agricultural areas. Mostly lowlands.

REMARKS

Although de Vis (1884b) described *Myophila vivax* with a fixed eyelid, the name is easily referred to this taxon. A very large transparent palpebral disc, which is often kept tightly closed giving the appearance of a 'naked' eye, virtually fills the lower eyelid. *Heteropus blackmanni* de Vis was

placed, with question, in the synonymy of *Lygosoma peronii* Duméril and Bibron by Boulenger (1887). De Vis (1888) accepted *blackmanni* as a junior synonym of *peronii* but noted that the latter name was occupied in the genus *Lygosoma*. Zietz (1920) listed *blackmanni* as the available name for *peronii*, while Mittleman (1952) recognized it as a separate species. Mitchell (1953) treated the taxon as a synonym of *peronii* but gave *vivax* as the available name. *Peronii* has been shown since by Greer (1976) to be a senior synonym of *Carlia spinauris* Smith, a species from Timor and nearby islands.

The holotype of *Myophila vivax* has not been located (Covacevich, 1971). To stabilize the nomenclature we have selected a neotype. De Vis's specimen came from Brisbane.

Neotype: QM J24176 Mt Coot-tha, Brisbane, SE Queensland (27°29'S, 152°57'E). Collected by G. Ingram, C. Corben and D. Miller on 25 July, 1973.

SV: 41. **HW:** 15. Tail regenerated.

Prefrontals separated. Supraciliaries 5. Palpebral disc very large. Ear aperture smaller than disc, longer axis vertical, with one enlarged lobule on anterior margin. Midbody scale rows 32; mid-dorsal scales hexagonally shaped and bicarinate. Lamellae under fourth toe 22.

Dorsally and laterally brown, except for two faint darker brown paravertebral stripes and bluish labials. Ventrally yellow except for underside of head, which is blue.

Covacevich (1971) reported the existence of a series of specimens (QM J19968-90) found in a jar labelled 'Cotypes *Heteropus blackmanni*' and another specimen J7773 found in a jar labelled '... probably one of type species ...'. The latter specimen was examined by Mitchell (1953), and it is, as he said, a specimen of *C. vivax*. The series was not examined by him. The register entry for J7773 is 'old coll: taken from series which is probably type material of *Heteropus blackmanni* de Vis'. It seems reasonable to assume that J7773 was removed from the series of specimens now registered as J19968-99. Examination of the 23 specimens labelled 'Cotypes' shows they represent six species: *Lygisaurus foliorum*, J19971; *C. pectoralis*, J19972, 19974, 19976; *C. rubrigularis*, J19987; *C. storri*, J19975, J19977-9, J19981, J19986, J19988; *C. vivax*, J19970, J19973, J19980, J19982-5, J19989-90; *C. munda* J19969; J19968 could not be identified because of its poor condition. J19985, a specimen of *C. vivax*, is selected as the lectotype of *Heteropus blackmanni*.

KEY TO SPECIES OF *CARLIA*

- 1 Interparietal distinct 2
Interparietal fused with frontoparietal ... 22
- 2(1) Mid-dorsal scales smooth, striated, or feebly keeled with smoothly curved posterior edges 3
Mid-dorsal scales moderately to strongly keeled and hexagonally or quadrangularly shaped 8
- 3(2) Keels of mid-dorsal scales each broken up into 3 to 5 rounded tubercles 6
Keels of mid-dorsal scales not broken up into rounded tubercles 4
- 4(3) Palpebral disc very large, covering much more than half of lower eyelid; white line from under eye inserting on top of ear aperture, recommencing below and continuing backwards, supraciliaries usually 5 or 6 *munda*
Palpebral disc small, equal to about half of lower eyelid; no white line as above; supraciliaries 7 5
- 5(4) Ear aperture vertically elongate with one or more long acute lobules on margins... 23
Ear aperture round with at least one short rounded lobule on anterior margin..... *tetradactyla*
- 6(3) Midbody scale rows 30 or fewer . *rimula*
Midbody scale rows 36 or more..... 7
- 7(6) Ear aperture with small rounded lobules on margins; juveniles sharply achromatically patterned..... *coensis*
Ear aperture surrounded by long, thin, acute lobules on margins; juveniles dark, unpatterned..... *scirtetis*
- 8(2) Mid-dorsal scales bicarinate 9
Mid-dorsal scales tricarinate 17
- 9(8) Ear aperture surrounded by pointed lobules on margins; supraciliaries usually 6 or 7 10
Ear aperture with at least one or two larger rounded lobules on anterior margin; supraciliaries usually 5 or 6 .. 13
- 10(9) Supraciliaries usually 7, midbody scale rows usually 34 or more 11
Supraciliaries usually 6 or 7, midbody scale rows usually 33 or less..... 12
- 11(10) Large dark, mottled tree or rock-dwelling skink (maximum SV 56 mm); snout depressed; from eastern Queensland..... *mundivensis*
Small dark brown (sometimes flecked with white) ground dwelling skink (maximum SV 43 mm); snout not depressed; Kimberley region Western Australia *johnstonei*
- 12(10) Breeding male pale brown with orange legs and tail. Juvenile and female, pale brown with white mid-lateral, dorsolateral and pale vertebral lines, the latter enclosing darker paravertebral stripes ... *storri* sp. nov.
Breeding male heavily spotted with blackish brown and flecked with white; reddish tinge to flanks. Juvenile and female, dark brown with well-defined white midlateral and dorso lateral lines; pale paravertebral lines; the dorsolateral and paravertebral lines enclose darker vertebral and laterodorsal stripes *bicarinata*
- 13(9) Ear aperture horizontally elongate, supraciliaries usually 6 *amax*
Ear aperture vertically elongate; supraciliaries usually 5 or 7..... 14
- 14(13) Supraciliaries usually 7; two large squarish lobules on anterior margin of ear aperture *schmeltzii*
Supraciliaries usually 5; 1 or 2 rounded lobules on anterior margin of ear aperture 15
- 15(14) Juvenile and females with pale vertebral stripe, lamellae under fourth toe usually 29 or more; ear black..... *dogare*
Juveniles and females with no pale vertebral stripe, lamellae under fourth toe usually less than 29; no black ear..... 16
- 16(15) Juveniles and females pale brown, with white dorsolateral line; breeding male pale brown with blue throat, pink sides or thick pink midlateral stripe *vivax*
Juveniles and females dark, with no dorsolateral stripe; breeding male dark, with two red lateral stripes; the lower one can be broken up into dots; scales on throat and side of head edged in black. On the Whitsunday Island Group, females strongly blotched with black and breeding males with a series of up to 10 black longitudinal dorsal stripes *pectoralis*
- 17(8) Palpebral disc small, occupying about half lower eyelid; ear aperture about same size as disc..... 18
Palpebral disc large, occupying much more than half of lower eyelid; ear aperture much smaller than disc 19
- 18(17) Supraciliaries usually 7; ear aperture ver-

- tically elongate 24
 Supraciliaries usually 5; ear aperture horizontally elongate *gracilis*
 19(17) Ear aperture horizontally elongate, mid-dorsal scales moderately keeled; supraciliaries 6 or 7 20
 Ear aperture round or vertically elongate; mid-dorsal scales strongly keeled; supraciliaries usually 5 or 6 21
 20(19) Juvenile and female with a distinct white line outlined in black from eye to hind leg; breeding male with 5 to 7 blue dorsal stripes, dark blue upper lateral stripe flecked with white, and a red stripe below this *jarnoldae*
 Juvenile and female with a whitish stripe from under eye to ear and occasionally to foreleg. Breeding male with red mid-lateral stripe *rufilatus*
 21(19) Prefrontals usually in contact; mid-dorsal scales tricuspid, quadrangularly-shaped so that keels are not aligned; usually 6 supraciliaries *triacantha*
 Prefrontals narrowly to widely separated; mid-dorsal scales tricarinate, hexagonally shaped so that the keels are well aligned to form more or less continuous lines along body; usually 5 supraciliaries *pectoralis*
 22(1) Throat and neck colour blue and pink *rhomboidalis*
 Throat and neck colour pink only *rubrigularis* sp. nov.
 23(5) Males boldly marked with black throat, black speckled back, black upper lateral stripe continuing to near hind limb, and red below the stripe, females boldly marked with distinct white dorsolateral stripes and midlateral stripes continuing to behind forelimb *rostralis*
 Comparatively drably marked with white (throat, brown back, black upper lateral stripe continuing to forelimb, and red or brown sides *longipes*
 24(18) Ear aperture with 9-16 short to long, pointed lobules around margin *mundivensis*
 Ear aperture with usually two large squarish lobules on anterior margin *schmeltzii*

ACKNOWLEDGEMENTS

For the loan of specimens we are grateful to Dr L. Capocaccia (Museo Civico di Storia Naturale);

Dr G. Peters (Zoologisches Museum, East Berlin); Drs H.G. Cogger and A.E. Greer (Australian Museum, Sydney); Mr A.J. Coventry (Museum of Victoria, Melbourne); Dr J. Guibe (Muséum Nationale d'Histoire Naturelle, Paris); Dr T. Houston (South Australian Museum, Adelaide); Miss E. Grandison and Mr A.F. Stimson (British Museum Natural History, London); Dr G.M. Storr (Western Australian Museum, Perth); the Donald Thomson Administration Committee; Professor E.E. Williams (Museum of Comparative Zoology, Harvard); Dr M. King and Mr G. Gow (Northern Territory Museum of Arts and Sciences, Darwin).

Dr H.G. Cogger and Mr P. Rawlinson provided information on type specimens examined by them in foreign institutions.

Financial support for this work has been received from the Australian Museum (travel grant to enable GI to examine reference collections there); Australian Research Grants Committee (grant which enabled GI to work with Drs H.G. Cogger and H. Heatwole in Torres Strait); Australian Biological Resources Study (grant which enabled GI to work on Cape York Peninsula with Dr J. Kikkawa and grant to Australian and Queensland Museums that enabled JC to survey eastern Australian rainforest fauna); and Australian Institute of Aboriginal Studies (grant to Cape York Ecology Transect). Mr Fred Parker, Mr K. McDonald, and Mr T. Low have supplied field data and specimens for this study. Messrs B. Campbell, A.J. Coventry and G.V. Czechura, and Drs H.G. Cogger, A.E. Greer and G.M. Storr have provided advice throughout this work and criticized the manuscript. Dr R. Raven, Mr R. Sadler, Ms D. Case, Mrs P. Woodgate, Mrs K. Couper, Ms L. Crevola-Gillespie, Ms R. Owens and Ms J. Stewart have assisted us with the manuscript. Steve Wilson and David Knowles kindly allowed us to use many of their photographs.

LITERATURE CITED

- ARNOLD, J.M. 1966. 'A Taxonomic study of the lygosomid skinks of Queensland'. Unpublished M.Sc. thesis (University of Queensland: Brisbane).
 BOLLINGER, G.A. 1885. Remarks on Mr. C.W. De Vis's recent contributions to the herpetology of Australia. *Ann. Mag. Nat. Hist.* (5)16: 386-7.
 1887. 'Catalogue of the lizards in the British Museum (Natural History). Vol. 3'. (British Museum: London).
 COGGER, H.G. 1975. 'Reptiles and amphibians of Australia'. (Reed: Sydney).
 1979. *Ibid.* 2nd edition.
 1983. *Ibid.* 3rd edition.
 1986. *Ibid.* 4th edition.

- COGGER, H.G., CAMERON, E.E. AND COGGER, H.M. 1983. 'Amphibia and reptilia. Vol. 1. Zoological Catalogue of Australia'. (Australian Government Printing Service: Canberra).
- COGGER, H.G. AND LINDNER, D.A. 1974. Frogs and reptiles. p. 63-107. In Frith, H.J. and Calaby, J.H. (eds), 'Fauna survey of the Port Essington district, Coburg Peninsula, Northern Territory of Australia'. C.S.I.R.O. Aust. Div. Wild. Res. Tech. Pap. No. 28.
- COVACEVICH, J. 1971. Amphibian and Reptile type specimens in the Queensland Museum. *Mem. Qd Mus.* 16: 49-68.
1976. Amphibians and reptiles. p. 16-18. In Covacevich, J. (ed.), 'Fauna of eastern Australia rainforest: Preliminary report on sites surveyed by the Queensland Museum in mid-eastern and north eastern Queensland'. (Queensland Museum: Brisbane).
- COVACEVICH, J. AND INGRAM, G.J. 1975. Three new species of rainbow skinks of the genus *Carlia* from northern Queensland. *Vic. Nat.* 92: 19-22.
1978. An undescribed species of rock-dwelling *Cryptoblepharus* (Lacertilia: Scincidae). *Mem. Qd Mus.* 18(2): 151-154.
1980. The endemic frogs and reptiles of Cape York Peninsula. p. 49-57. In Bailey, A. and Stevens, N.C. (eds), 'Contemporary Cape York Peninsula'. (Royal Society of Queensland: Brisbane).
- COVACEVICH, J., INGRAM, G.J. AND CZECHURA, G.V. 1982. Rare frogs and reptiles of Cape York Peninsula, Australia. *Biol. Conserv.* 22: 283-294.
- COVENTRY, A.J. 1971. The discovery of the lizard genus *Carlia* (Scincidae: Lygosominae) in Victoria. *Vic. Nat.* 88: 20-2.
- CROWSON, R.A. 1970. 'Classification and biology'. (Heinemann Educational Books: London).
- DE VIS, C.W. 1884a. A conspectus of the genus *Heteropus*. [In Anon], *Brisbane Courier*, November 15, p. 6. Republished 1884, *Daily Observer*, November 15, p. 3. (Abstract of de Vis, 1885).
- 1884b. New Queensland lizards. *Proc. Roy. Soc. Qd* 1: 77-78.
1885. A conspect of the genus *Heteropus*. *Proc. Roy. Soc. Qd* 1: 166-73.
1888. A contribution to the herpetology of Queensland. *Proc. Linn. Soc. N.S.W.* (2)2: 811-26.
- DUMÉRIL, A.M.C. AND BIBRON, G. 1839. 'Érpetologie générale ou histoire naturelle complète des reptiles.' Vol. 5. (Librairie Encyclopédique de Roret: Paris).
- GOLDMAN, J., HILL, J. AND STANBURY, P.J. 1969. Type specimens in the Macleay Museum, University of Sydney. II. Amphibians and Reptiles. *Proc. Linn. Soc. N.S.W.* 93: 427-38.
- GREER, A.E. 1974. The generic relationships of the scincid lizard genus *Leiopisma* and its relatives. *Aust. J. Zool. Suppl. Ser.* 31: 1-67.
1975. Notes on the systematics of the genus *Carlia* (Lacertilia: Scincidae) I. *Carlia melanopogon* Gray 1845. *Herpetologica* 31: 70-5.
1976. Notes on the systematics of the genus *Carlia* (Lacertilia: Scincidae). II. *Carlia peronii* (Duméril & Bibron 1839). *Herpetologica* 32: 371-7.
- INGRAM, G.J. 1986. Scales, feathers and fur: Vertebrate zoology. *Mem. Qd Mus.* 24: 151-171, 340-341. (in press). The works of Charles Walter de Vis, alias, 'Devis', alias 'Thickthorn'. *Mem. Qd Mus.* 28.
- INGRAM, G. AND COVACEVICH, J. 1980. Two new lygosomine skinks endemic to Cape York Peninsula. p. 45-48. In Bailey, A. and Stevens, N.C. (eds), 'Contemporary Cape York Peninsula'. (Royal Society of Queensland: Brisbane).
1981. Frog and reptile type specimens in the Queensland Museum, with a checklist of frogs and reptiles in Queensland. *Mem. Qd Mus.* 20(2): 291-306.
- 1988a. Revision of the genus *Lygisaurus* de Vis (Scincidae: Reptilia) in Australia. *Mem. Qd Mus.* 25(2): 335-354.
- 1988b. Comments on the proposed suppression for nomenclature of three works by R.W. Wells and C.R. Wellington (1). *Bull. Zool. Nomencl.* 45(1): 52.
- KEAST, A. 1962. Vertebrate speciation in Australia: some comparisons between birds, marsupials and reptiles. p. 380-407. In Leeper, G.W. (ed.), 'The evolution of living organisms'. (Melbourne University Press: Melbourne).
- KIKKAWA, J., MONTEITH, G.M. AND INGRAM, G.J. 1981. Cape York Peninsula: Major region of faunal interchange. p. 1695-1742. In Keast, A. (ed.), 'Ecological biogeography of Australia'. (D.W. Junk: The Hague).
- KLUGE, A.G. 1963. Notes on the Herpetofauna of Western Australia. *West. Aust. Nat.* 8: 144-7.
- LOVERIDGE, A. 1934. Australian reptiles in the Museum of Comparative Zoology, Cambridge, Massachusetts. *Bull. Mus. Comp. Zool.* 77: 243-383.
1948. New Guinea reptiles and amphibians in the Museum of Comparative Zoology and United States National Museum. *Bull. Mus. Comp. Zool.* 101: 305-430.
- MITCHELL, F.J. 1953. A brief revision of the four-fingered members of the genus *Leiopisma* (Lacertilia). *Rec. S. Aust. Mus.* 11: 75-90.
- MITTLEMAN, M.B. 1952. A generic synopsis of the lizards of the subfamily Lygosominae. *Smith. Misc. Coll.* 117: 1-35.
- Ogilby, J.D. 1890. Report on a zoological collection from British New Guinea. Part 1. Reptiles, batrachians and fishes. *Rec. Aust. Mus.* 1: 89-101.
- PATERSON, H.E.H. 1985. The recognition concept of species. p. 21-29. In Vrba, E.S. (ed.), 'Species and speciation'. *Transvaal Museum Monograph* No. 4.
- STORR, G.M. 1974. The genus *Carlia* (Lacertilia, Scincidae) in Western Australia and Northern Territory. *Rec. W. Aust. Mus.* 3: 151-65.
- STORR, G.M., SMITH, L.A. AND JOHNSTONE, R.E. 1981. 'Lizards of Western Australia. I. Skinks'. (University of Western Australia Press and Western Australian Museum: Perth).
- WELLS, R.W. AND WELLINGTON, R.C. 1984. A synopsis of the class Reptilia in Australia. *Australian Journal of Herpetology* 1(3-4): 73-129.
1985. A classification of the Amphibia and Reptilia of Australia. *Australian Journal of Herpetology Supplementary Series* 1: 1-61.
- WILHOFT, D.C. 1963a. Reproduction in the tropical